After the administration of C,H,N,H,O,Mg (5 mg 1.2 x 10⁻⁶ g) to each silkworm larva on the 3rd-4th day of the 8th instar, silica fibres (1) is isolated from posterior gland, by washing with 0.14M H₂SO₄, distilled water, 0.01M HCl, and ether in order, and the radioactivity of it is determined. The labelled glycine is incorporated non-uniformly, but it is present predominantly in C-terminal amino acids of 1 molecule. (CA 26:1096, 10988a)


C³¹-labelled amino acids were injected into the hemolymph of larvae. The resulting pattern of incorporation was investigated by direct paper chromatography of the injected larvae and by column fractionation of larval extracts. Injected amino acids were rapidly incorporated into a larger number of components, of which several peptides, often containing non-amino acid constituents of unknown nature, are major portion of the amino acids in insect hemolymph occur in bound form. In order to obtain larger amounts of amino acids in non-protein-bound forms, attempts were made to inhibit protein synthesis. Of the treatments used only methanol and chlorpromazine were effective in reducing protein synthesis and this reduction was accompanied by a decrease in amount in all radioactive metabolic products. The possible significance of this reduction is discussed. Material containing bound C³¹-glutamic acid was isolated from larval extracts and reheated. Radioactivity from the isolated material was found to be incorporated into the protein of the larvae but at a slower rate than was the free amino acid. The implications are discussed.


By means of a special apparatus large numbers of larvae could be injected with as little as 0.05 ml, with an error of ca. ±2%. For studies of incorporation of amino acids in these series, larvae were injected and washed, placed on filter paper and squashed. Phosphate-1% aqueous ammonia (8:1) was used mostly for chromatography. Radioactive C³¹-labelled L-glutamic acid (4 µCi/180 µl), L-leucine (10 µCi/20 µl) and L-valine (10 µCi/20 µl) were used, isolated fractions being reconstituted in some experiments. It is concluded that the injected amino acids are very rapidly incorporated into peptides of various sizes. Subsequently they enter into proteins, but the mechanism of synthesis is not understood. In initial stages, mixed peptides containing C³¹-labelled glutamic acid are incorporated into proteins at about the same rate as glutamic acid itself, but whether the peptides are incorporated directly or are first hydrolysed remains an open question. Glutamic acid (glutamin, alanine and aspartic acid behave similarly) goes very rapidly into peptides and relatively slowly into proteins. It is widely distributed in bound form (peptides). Leucine and valine, however, which are amino acids essential to Drosophila, appear in relatively few peptides more directly and rapidly in proteins. Chloramphenicol and fluoromethimazine had no influence on the rate of incorporation of amino acids into proteins in this in vitro system, even when saturated solutions were injected. So far, no inhibition have been found which specifically inhibit protein synthesis in the larvae.


The residual non-histone proteins in the chromosomes was studied by means of high-resolution autoradiography after feeding with methionine-³⁵S throughout larval life. (From EM 14, 1980, 3932)


Drosophila melanogaster and D. virilis were used. Salivary chromosomes labelled in vivo for short times with methionine-³⁵S or C³¹ and leucine-³⁵S reveals a pattern of labelling that resembles qualitatively that in chromosomes labelled throughout larval life with methionine-³⁵S. The autoradiographs of discrete chromosomal regions, on which that pattern is based, are not displaced after withdrawal of traces or affected by treatment with ECH as an unfolding agent. It is concluded that the pattern of labelling originally described represents a pattern of localized protein synthesis superimposed on the protein backbones of the chromosome. Several possible aspects of this pattern are discussed. (Essentially same, summary)

Brainless, dispaying pupae of Callimica cecropia were each injected with 2.6 μg valine-1-C14. Various tissues were removed from which the proteins were precipitated, washed, and plated, and the radioactivity measured. The rates of incorporation of proteins into the tissues were reported as specific activities representing specific activities of protein. In 18 animals the specific activity in blood, fat body, epidermis, and midgut 12 h after injection of valine-1-C14 was 0, 40, 100, and 200, respectively. In 31 animals injected with similar doses of labelled valine on the 2nd or 3rd day after initiation of adult development, at the end of 12 h after injection, the specific activity in blood, fat body, gut, and epidermis was 100, 350, 255, and 1420, respectively. There was a further increase in incorporation in some tissues by the 17th day of development. The specific activity of eggs, epidermis, blood, fat body, and muscle at 5 h after injection was 200, 1500, 300, 175, and 1200, respectively. The blood proteins were 1.5-2.5 times more highly labelled than those of 2-3 day-old animals. Fat body showed little ability to incorporate amino acids. When animals were injured by removal of the cuticle in the facial region, the uptake of labelled valine by blood, fat body, gut, and epidermis was greatly increased. Injections of 0.14 ml 10% Metho in insect stage's solution, and 4000 Callophila units of purified endoxyme in 0.04 ml 10% Metho in insect stage's solution both greatly increased the amount of labelled amino acid incorporated into proteins. Endoxyme release has 3 effects on a dispaying animal: to increase metabolism, and to remove metabolic pathways toward growth and differentiation. Injury can duplicate the first effect but not the 2nd. The radiocactivity of subcellular fractions of thoracic muscle was measured in 16 animals on the 17th and 21st day of adult development. Two hours after injection of 2.6 μg valine-1-C14, the specific activities in 17-20 day-old animals were 911, 766, 678, and 664 for mesentocytes, myofibers, soluble cell fractions, and sarcosomes, respectively. For the same cell fractions in 21-30 day-old animals, the specific activities were 566, 320, 385, and 395, respectively. Hence, amino acids were incorporated into all cell fractions. (CA 58: 1968, 34858b)


Fat body tissue from larvae and pupae of saturniid silkworms was incubated with leucine-1-C14, and incorporation into total protein was measured. Midgut tissue was also used in a few experiments. In a medium of salts and amino acids based on the composition of silkworm haemolymph, incorporation by fat body is linear for at least 6 h, whereas some media give declining rates and in severely hypoosmotic media, or with homogenates, incorporation is virtually abolished. In fat body from mature larvae the rate of amino acid incorporation is high; in tissue from dispaying pupae it has fallen to about 0.3% of the larval rate, and by an early stage of adult development it has risen again to about 10% of the larval rate. The activity of fat body and midgut also rise after injection of a low dose of leucine-1-C14. (Auth.)

7. (hyalophora cecropia, Antheraea polyphemus and Samia Cynthia)


After feeding through a membrane on a solution of glucose-C14, M. persicae was found to synthesize alanine, aspartic acid, serine, glutamic acid, glycine, cystine, and two unidentified amino acids. Aspartic acid, recovered as aspartic acid, was also synthesized. Threonine, valine, leucine, isoleucine, lysine, glucosamine, proline, and arginine were not synthesized in any appreciable extent and are considered to be nutritionally essential. Tyrosine was not synthesized and has been classified as essential pending further investigations to elucidate a phenylalanine to tyrosine synthesis. (Auth.)


By differential centrifugation at 1000, 3000, 15000, and 105000 g successively the homogenerate of posterior silk gland in 0.25 M sucrose was fractionated into K (small), M (middle), L(large and medium pellicular granules), S (small microgranules), and soluble supernatant. RNA containing micronemes were released from K by deoxycholate treatment. RNA was highest in S, lower in M and L, and absent

(Ann. Inst. Pasteur)
from the soluble fraction. M and L were rich in phospholipid. R contained a large amount of fibroin. The 4 sedimenting fractions were examined for C14 following the injection of glycine-1-C14 (specific activity 6.1 mcg/2.2 mg). It showed an initial, temporary rise in C14 incorporation, presumably to its microsomal activity, and later incorporation of C14 to fibroin of R when C5 acylations of L, M, and S fractions were decaying. Microsomes in homogeneous states in H, M, L, and S fractions play a role in taking up glycine for protein synthesis. (Furn of this paper: presented at the annual meetings of the Agricultural Chemical Society of Japan, Tokyo 1965 and Tokyo 1969).


Glycine-1 C14 (specific activity 4.1 mcg/100) was injected into silkworms (see 292 for details, also of cell fractionation, chemical assays of RNA phosphates, total N and glycine). Enzyme assays, sample preparation for electron microscopy, and subfractionation of the cellular fractions obtained from homogenizing the posterior silk glands into fractions M, L, and S are described. Following injection of 5000 cpn/silk worm of glycine-1-C14 the incorporation of the glycine into the proteins of the subtractions was studied. The initial rise in radioactive activity was predominantly in the deoxycholate-insoluble proteins, the radioactivity in the soluble protein increasing more slowly and linearly. Recoveries of RNA in the insoluble subtractions were 95, 60 and 77% for M, L, and S, respectively. A showed the highest acid phosphatase and ribonuclease activities, electron microscopic observations revealed microsomal structures in all particulate fractions; it contained electron-dense granules, small microvesicles and free Palade-particles.


Amino acid activating enzyme (I) is purified from N fraction of posterior silk gland of Bombyx mori by (NH4)2SO4 fractionation (0.0-0.8 saturation) at pH 8, removing the impurities by centrifuging off the precipitates at pH 4, 8, and precipitation of (I) at pH 8.0 by 0.8 saturation with (NH4)2SO4. (I) activates incorporation of C14-labelled glycine into deoxycholate treated particulate of silk gland of B. mori in the presence of the incorporation enzyme and ATP (adenosine triphosphate). Unlike the N fraction, the action of (I) does not accompany any appreciable exchange reaction between P32 labelled pyrophosphate and ATP. (I) is inactivated by heating (90°C for 3 min) and stable for as long as 5 d at -10°C. Amino acid activation by way of amino acyl aasay is adequate. (From CA 55: 1061, 13483a).


Relative rate of incorporation of glycine-1-C14 (I), DL-lysine-1-C14 (II) and DL-leucine-1-C14 (III) is determined in the cell-less system, consisting of 1/5 deoxycholate-treated, 20,000 g precipitated particulate fraction (IV), amino acid incorporating supernatant enzyme (V), amino acid activating enzyme (VI), adenosine triphosphate, 10°K, and amino acid mixture. IV, V, and VI prepared from Bombyx mori. Amoeba (捻), and rat liver, can replace the respective fractions of different animals. The maximum incorporation rate of II and III is attained by using the IV preparations from I, II, and III. This is more unstable than IV of II and III or rat liver, especially the activity towards II (CA 58: 1968, 8164g).


Silk glands of the silkworm are useful since in a cell-free system polymolecules may lead to information on the synthesis of a given polypeptide, and the glands produce fibroin and sericin of a known and very specific amino acid composition. RNA from posterior and middle silkgallded (9th instar Bombyx mori) was fractionated and the nucleic composition established for each fraction. Based on the content of amino acids in the silk protein the nucleic composition of the so-called "message RNA" (mRNA) was calculated and compared with the composition of received fractions. The influence of these fractions upon the incorporation of the C14 labelled amino acids (specific for silk) into the cell-free system from 5, coli was then investigated. After p2H-incorporation into the glands, mitochondria and posterior RNA was separated out. Results are tabulated and discussed.

Tanaka, S., TRANSFER OF AMINO ACIDS INCORPORATED INTO SILK GLANDS OF BOMBYX MORI V. (R1), small particles (R2), A-containing amino acid-activating enzyme was injected into a silkworm glycine-1-C14 and the sugar:transfer of radioactivity from presence of amino acid in RNA in Bombyx mori, E1 and E2 no E1, no E2, condition, but inhibition was (100% from) deoxyribonucleic acid (10°M), N nucleotides (19°M3, 1961, 25842g).

Tanaka, S., Suzuki, S., SHIRUMA, K. GLYCINE-ACTIVATING ENZ.

The crude glycine-P-activating enzyme further purified by precipitation diethylaminoethyl cells (37°C, 10 min) the formation at pH 8.0, and also a major amino acid component. The 6 (NH4)2SO4 to remove free ATP of ribonucleic acid (RNA) activated into the specific activation of the catal.


Relative rate of incorporation of glycine-1-C14 (I), DL-lysine-1-C14 (II) and DL-leucine-1-C14 (III) is determined in the cell-less system, consisting of 1/5 deoxycholate-treated, 20,000 g precipitated particulate fraction (IV), amino acid incorporating supernatant enzyme (V), amino acid activating enzyme (VI), adenosine triphosphate, 10°K, and amino acid mixture. IV, V, and VI prepared from Bombyx mori. Amoeba (捻), and rat liver, can replace the respective fractions of different animals. The maximum incorporation rate of II and III is attained by using the IV preparations from I, II, and III. This is more unstable than IV of II and III or rat liver, especially the activity towards II (CA 58: 1968, 8164g).


Relative rate of incorporation of glycine-1-C14 (I), DL-lysine-1-C14 (II) and DL-leucine-1-C14 (III) is determined in the cell-less system, consisting of 1/5 deoxycholate-treated, 20,000 g precipitated particulate fraction (IV), amino acid incorporating supernatant enzyme (V), amino acid activating enzyme (VI), adenosine triphosphate, 10°K, and amino acid mixture. IV, V, and VI prepared from Bombyx mori. Amoeba (捻), and rat liver, can replace the respective fractions of different animals. The maximum incorporation rate of II and III is attained by using the IV preparations from I, II, and III. This is more unstable than IV of II and III or rat liver, especially the activity towards II (CA 58: 1968, 8164g).

The yellow pigment of Papilio xuthus Var. has been found to contain some substance. Its pigments are characteristic. melanic and the corresponding melanine pigments from the larvae of a variety of variously colored Pieridae are synthesized from the larva of a white-dotted common ancestor of the Pieridae family.

Vandenberg, L. P., THE OLIG ENZ (EBONIC ACID) I.
observed a large amount of fibrin.

197 Tanaka, S. TRANSFER OF RADIOACTIVITY FROM RELABELLED CELL DESS TO PARTICULATE


Amino acid-incorporating activity of posterior silk glands was studied on the sub-cellular level. Posterior silk glands of Bombyx mori were homogenized and centrifuged to give cell debris (CD), large particles (LP), small particles (EP), and a fraction containing amino acid-incorporating enzyme, and a fraction containing amino acid-activating enzyme. To prepare C^4^ labeled CD in vivo, 2 μg of glycine-β-C^4^ was injected into a silkworm, and the above procedure was undertaken. Enzyme activity of aliquots with glycine-β-C^4^ and the subsequent homogenization was employed to prepare C^4^ labeled CD in vivo. Transfer of radioactivity from labeled CD to LP, reached an equilibrium in 10 min, and required the presence of an amino acid mixture, guanine triphosphate, an energy source such as creatine phosphate, and ATP but not EP. Transfer of radioactivity to LP was also observed under similar incubating conditions, but inhibition was induced by the pre-treatment of C^4^ labeled CD with either ribonuclease (100 μg/ml), deoxyribonuclease (100 μg/ml), deoxyribozyme, or deoxyribonuclease (20 μg/ml). Cholinesterase (10^"^6^ to 10^"^4^) did not inhibit the transfer reaction. (CA 66: 1965, 32148g).


The crude glycine-β-activating enzyme (AT) preparation of the posterior silk gland of Bombyx mori was further purified by precipitating with (NH_4)_2SO_4 (100% saturation) and reprecipitating with ribonuclease by diethylaminoethyl cellulose column chromatography. Upon incubation of ATP with ATP-α, γ-P^3^ at 37°C, ATP-β-P is formed, which is not further hydrolyzed to ATP and P. ATP-β-P was formed in the presence of ribonuclease and ATP, and was shown to contain less than 1 mol of ATP/mol of β-P. When ATP/mol of β-P is used, the ratio of ATP is increased. ATP-β-P is more effectively incorporated into the synthesized protein than a mixture of ATP, β-P, C^4^, β-P, and amino acids. A specific activity of ATP-β-P is synthesized in the presence of ATP, but not by free β-P, is increased. (CA 67: 1965, 10151v).


The red brown scales of Papilio procerus on alkaline hydrolysis yielded no amorphous acid. Therefore, type B red pigment in the Papilionidae may not be an amorphous pigment. A similar treatment of type C red pigments of Vanessa indica indicates an amorphous pigment. Autoradiographs of Graphium antilope, whose prepig has been injected with tryptophan-β-C^4^, indicated no incorporation of tryptophan in the type A and wing pigments. Similar treatment of V. indica indicated the incorporation of tryptophan into type C red pigment. (CA 69: 1965, 9256u).


The yellow pigments of Papilio machaon, papilioxestus and Papilio machaon are not amorphous pigments since much of these are different. The yellow kynurenine pigments may be derived by the peptone and the amorphous pigment, which characteristic of the Papilionidae is characteristic of the Vanessa of nymphalid, many systematic groups have their own characteristic pigments. These characteristic pigments are synthesized by the animals whereas the amorphous pigment is derived from the plant food of the larva of a widely distributed group of Lepidoptera. Perhaps this last pigment is the pigments of the common ancestor of the Papilionidae and Papilionidae. (CA 69: 1963, 1391d).


The hormone from the corpus allatum in E. spilogaster is necessary for deposition of yolk in its oocytes. Incorporation of ^3^H-labeled precursors of DNA (thymidine-^3^H), RNA (uridine-^3^H), and protein (leucine-^3^H) were studied with high activity in such a way as to either leave or remove the corpus allatum; the
Allaeracoustics bugs showed little difference from the control in DNA synthesis, but RNA and protein synthesis were drastically reduced by removal of the gland. (CA 25: 1964, 2654g)


The [3-C] acetate formed in vivo following the intrahemocoelic injection of [3-C] acetate into adult Musca domestica was assayed by paper chromatography from the other labelled compounds formed and then assayed radiochemically. Maximum specific radioactivity of the acetylcholine fraction was rapidly achieved within 15 min. Acetylcholinesterase appeared to "uncouple" acetylcholine synthesis in the sense that the overall metabolism of [3-C] acetate and respiration increased while formation of [3-C] acetylcholine was considerably reduced. The effect of malathion on [3-C] acetate synthesis was partly reversed on injecting pyridoxine-5-phosphate methiodide together with streptomycin, but, unlike the case of dipropylphosphorothioate, there was no reversal of the outward signs of poisoning. Metabolism directly affected the metabolism of acetylcholine in vivo.


A method is described for the microdetermination of acetylcholinesterase activity in which the formation of acetic acid labelled with C14 liberated enzymatically from the labelled substrate, is measured by a simple counting technique. The method has the advantage that it can be applied to very small samples of tissue at relatively constant pH. Tests on diluted cholinesterase-active tissue extracts from Musca domestica head are discussed. The technique provides a reliable indication of reversible cholinesterase inhibition by such compounds as carbamates, for example.


The study of acetylcholinesterase activity over a wide range of substrate concentrations (0.05-0.00006 M) is facilitated by radiometric methods. Head tissue of adult Musca domestica and homogenates of human whole blood were used for enzyme preparation. The effective Michaelis constant, the dissociation constant for the further reaction between normal enzyme-substrate complex and free substrate, and the dissociation constant for the reaction between inhibitor and free enzyme have been evaluated for both preparations in the presence of the insecticide 0,4-dipropylphenyl-N-methyl carbamate. The calculated and calculated decays to apparent enzyme inhibition as a result of sample dilution or increasing substrate concentration were in fair agreement. The observations are believed to be of significance in studies of the cholinesterase inhibition and toxicity relationships of the carbamate insecticides and in the measurement of blood cholinesterase inhibition as a result of carbamate exposure in man.


On injecting glucose-1-C14 into 9-10 day old papae of the cabbage moth, Pieris brassicae, 95% of the total radioactivity incorporated in leucopters is found in C-8 and C-9. With glucose-2-C14 as much as 80% are found there. This and other evidence suggest that the ribose carbon-1 is a precursor of C-8 of the prenol.


The distribution of the radioactivity in leucopters was determined after CH4CO2H-1-C14, CH4CO2H-2-C14, glycine-C14 (l), and D-glucose-1-C14 (j) were injected into larvae and pupae of Pieris brassicae. T was the main supplier of C atoms 4 and 6, and D of 8 and 9. (CA 54: 1960, 5866f).


To investigate the synthesis and structure of leucopters (l) C14-labelled purines, pyridazines, and furanic acid and glycine-1-C14 were injected into pupae of Pieris brassicae. Formic acid was the precursor of the C-2 atom and glycine ester dodecyl, sugars and their formed by C-1 of a pentose.

See also:
62 Quean bee food (jac)
134 The significance of
151 Biochemistry of diag
163 Transmission of pho
(Falco et al., 1961)
170 Pyrophosphate in ch
197 Polyphenolase and
357 Application of title
of salivary gland ch
348 Structure and func
347 Cell sites of RNA in
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351 Macromolecular syn
365 Synthesis and transi
virogenesis in the
362 Sites of carbohydrate
365 A microtform for
358 Intermediary metab
acids, (Soda
407 Conversion of piper
(Bart, 1961)
420 Cholinesterases in it
DDT and TEP. (Ha
422 Nucleotides and the
Ray, 1961)
425 The genetics and bi
446 The use of radioacti
958 Radiosotope studies

1-8

308 Bier, A.G., AUTOCRACIA
24, 3 (1960) 867.

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309 Beermann, W., CYTOLOG.

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Larvae of Bombyx mori were reared at the unit of the last instar, between 6 and 2 d before spinning. Some of the initial work was done on larvae of Tenea polyphemus. Larvae were infected directly with 10-100 µl of neutralized H3P orthophosphate or C3H0 Glycine. Two methods were used to prepare RNA. To confirm and extend previous results the composition of the RNA from anterior and posterior parts of the silk gland of B. mori was determined. For exchange chromatography and paper electrophoresis was used. Earlier analytical results on the composition of RNA from Lepidoptera silk glands were confirmed. Pulse labelling failed to detect a rapidly labelled RNA fraction with a composition different from bulk RNA.


H3-thymidine was used as a specific DNA precursor. A number of Diploids are considered. Nuclear differentiation, as measured by the size ratio of chromosomes to nucleus in mature cells of low as well as high polyphyletic and in proximal and distal nuclei, is interpreted as the result of differential rates of synthesis in euchromatin and heterochromatin. A lowering in multiplication in heterochromatin is not directly dependent on the kind of tissue or degree of polyphyletism but rather the result of its function which here depends on the position of the nucleus relative to the oocyte.


Short incubation with tritiated RNA precursor up to 30 min produces equally high levels of activity in all nurse cells. During this period, tritiated RNA streams from the heavily labelled nurse cell nuclei to the periphery of the myoblasts. Incorporation periods for 45 min or more lead to spots of intense activity in the oocyte near the intercellular bridges (Ponem) connecting the peripheral nurse cell nuclei to the cytoplasm of the smaller distal nurse cells. This is considered as evidence of RNA transport from the nurse chamber into the growing oocyte. As the insoluble compound of the tracer (i.e., RNA of high molecular weight) does not accumulate in the oocyte, a high turnover of RNA entering the oocyte via the intercellular bridges is assumed. It is pointed out that the processes described in this paper are similar to what is to be expected for messenger RNA. (Auth. summary)


By means of autoradiography, uptake of tritiated adenine by the ovary of the cricket (Grillus bimaculatus) was examined as previously described. A few adenine and low molecular weight polynucleotides were particularly high after cytoplasmic increase of oocytes and at the beginning of vitellogenesis. In follicular cells, all radioactivity observed in the nucleus was removed by ribonuclease. Not all cells surrounding the oocytes contained radioactivity. In labelled cells, RNA was found in 3 modes: in chromatin only; in nucleiolus, and in both chromatin and nucleolus. (CA 86, 123656).


The uptake of tritiated uridine and cytidine in the RNA of the cricket ovary (Grillus bimaculatus, Orthoptera) is described in terms of the duration of incorporation and of the physiological condition of the follicles. In the follicular cells, chromosomes are the primary site of RNA synthesis. With increasing incorporation time, labelled RNA moves towards the nucleus, where it accumulates. Afterwards, the radioactivity reaches the cytoplasm. The nucleoli lose their labelled material when the cytoplasmic activity is maximal. The speed of the migration from the nucleus to the cytoplasm depends on the necessary activity of the follicle cells: the more important the activity, the shorter the diffusion time.

See also Séranic: 313, 345, 346.

315 Favard-Sérée, C., Duran SES VARIATIONS AU COURS DE L'OOGÉNÈSE. (1963) 204-216.

After thyroxin injection, first and, after 5 minutes the middle stage of vitellogenesis increased treatment time; because higher in the need. No uptake of thyroxin is seen until the maximum, ratio genesis, and following long. At the middle stage of vitellogenesis, the DNA labelling is discussed. (From auth.)


Autoradiographs are shown (5) into giant chromosomes into an unstable protein with than the deoxyribonuclease.

319 Fijsh, S., Takamatsu, K., GENEPOEMENIES OF DIPTRE. Triticized uridine (1-5 µl) (Chromatide), radioactive autoradiographs made, Pa of deoxyribonucleic acid (1 of the DNA to regulate fun

318 Feuston, P. H., ABTOBIPLOICEE OBOEHR.


To solve the problem of w. H3-labelled thyroxin will be then 3-16 min. No cost 5 min. After 60-180 min of the growing oocytes but noted growth. No incorporated label into the follicular cell but with RNA. Some as a shift into the cytoplasm methyl green. The muscles intensive that in feed in a state of high more nutritive substances and in
This fact supports the hypothesis that the labelled RNA of the nucleus released to the cytoplasm is "messenger" RNA. In the oocyte, the uptake of uridine and cytidine is at first visible in the nuclear sap. Later on, the labelled RNA accumulates in the chromosomes and in the ooplasm. Although high during cytoplasmic growth, the RNA activity drops in the oocyte, soon after the beginning of vitellogenesis. (Auth.)


After thymidine injection, the number of labelled follicle nuclei increases while the secretion activity starts and, after a few minutes of incorporation, approximately one-third of the nuclei are radiating during the middle stage of vitellogenesis. Later on, there is a further rise in the number of labelled nuclei with increased incorporation time. Between the first and the middle stages of vitellogenesis, the radioactivity becomes higher in the nuclei in relation with the increasing amount of DNA per polyplid follicle nucleus. No uptake of thymidine is visible in the germinal vesicles. When the secretion activity of the follicle cells reaches its maximum, radioactive DNA occurs in their cytoplasm and in the ooplasm. During vitellogenesis, and following long treatment time, uridine is incorporated into DNA in the same way as thymidine. At the middle stage of vitellogenesis, cytidine follows a special pattern of incorporation: 96 h after injection, the DNA labelling extends to 10% of the follicle nuclei. The origin of the late DNA precursor is discussed. (From auth.)


Autoradiographs are shown for the incorporation of tritium-labelled cytidine, uridine, thymine, and leucine (1) into giant chromosomes of the salivary glands of larvae of Rhynchosciara angulata. I was incorporated into an unstable protein that has metabolic activity, more closely associated with the ribonucleic acid than with the deoxyribonucleic acid of the chromosome bands. (CA 65: 1501, 11048c)


Tritiated uridine (1-5 µc) mixed with 5-10 µg and labelled thymidine was injected in larvae of Rhynchosciara angulata. Autoradiographs made. Patterns of ADP grains and about the chromosomes suggest that specific regions of deoxyribonucleic acid (DNA) in the chromosomes are inactivated by a folding process to mask portions of the DNA to regulate formation of messenger RNA. (CA 66: 2064, 2064b)


To solve the problem of ways of "mature" DNA accumulating in the cytoplasm of the oocyte, 3-5 µg H3-labelled thymidine was injected into the abdomen of Cornea marginata females. Oocytes were fixed after 6-180 min. No considerable incorporation into the nuclei of ova cells could be found after 30 min. After 60-180 min heavy labelling occurred in the feeding cells and nearly all the follicular cells of the growing oocytes but only in individual cells of oocytes which had just started to grow or had resumed growth. No incorporation into embryonic restiode was found. Along with the incorporation of the label into the follicular cells, it was incorporated into the cytoplasm, and was stabilized even after treatment with RNase. Sometimes considerable incorporation into the oocyte membrane was noticed, as well as a shift into the cytoplasm of follicular cells (toward the oocyte) of the nuclear substance stained with methyl green. The nuclear stain with methyl green and Peniges in follicular cells was always more intense than that in feeding ones. All this suggested that during intensive growth of the oocytes the cells are in a state of high metabolic activity and seem to be able to participate in the accumulation of nutritive substance and DNA derivatives in the oocytes. (From English summary)

Ribonucleic acid (RNA) biosynthesis was followed autoradiographically through all stages of male meiosis in the locust Schistocerca gregaria, using 3H-uridine. All autosomes actively synthesize RNA throughout the whole of first meiotic prophase. Synthesis decreases progressively during diakinesis, as chromosome coiling becomes more and more complex, and has ceased by the time nuclear membrane breakdown occurs. No RNA precursor is incorporated into any autosome during first metaphase or anaphase. Throughout most of meiosis the single X-chromosome is diploid relative to the autosomes. No RNA precursor is incorporated and the X-chromosome is unduplicated throughout its entire length. (CA 69: 56905g).


See 321.


The base composition of the bulk RNA did not change significantly during the instar. 1H-pulse labelling during the earlier stage of the instar indicated the synthesis of a rapidly-turning-over RNA having a base composition different from that of ribosomal RNA and resembling that of DNA. Sedimentation analysis of RNA at this stage revealed the presence of components having different sedimentation constants than those of the ribosomal and soluble RNA. At a later stage of the instar, there was no evidence for the occurrence of a rapidly-turning-over RNA having a base composition different from that of ribosomal RNA. The role of RNA in silk fibroin synthesis is discussed. (CA 59: 18282, 11946d).


Blast larvac from Ch. th. ppleg x Ch. th. thummi of a late 4th instar or as prepupae were used. 3H-thymidine (specific activity 3.0 c/mmole) and 3H-thymidine (specific activity 20 c/mmole) in aqueous formic acid solution were injected into the haemocoele (0.25-1.0 μ). Various time intervals were allowed between injections. The course of DNA synthesis was followed autoradiographically and analytically. DNA replication starts simultaneously in all transverse bands with a continuous thymidine uptake. In the final phase DNA synthesis can only be detected in the heterochromatin sectors. All remaining transverse bands have completed DNA synthesis earlier, following a set sequence of events.


Ribosomal acid and desoxyribonucleic acid metabolism of individual tissues in pupae of Hyalophora cecropia and Danaus chrysippus were studied at various stages using autoradiographic techniques. Cecropia has an obligatory pupal diapause and although DNA synthesis and cell division proceed vigorously in larvae and prepupae, pupation signals cessation of DNA synthesis in most tissues. Thus incorporation of thymidine stops in epidermis, muscles, fat body, tracheae, wing buds, malphigian tubules and gut. However, the brain synthesizes DNA for 5-6 days after pupation and haemocoeysts remain active throughout diapause. In contrast, some strains of Cynthis have no diapause; in such non-diapausing pupae DNA synthesis continues after pupation. Each tissue has its own programme of DNA synthesis during adult development. The epidermis is the first to synthesize DNA. Muscles and fat body follow. Thus in Cynthis there is no period of dormancy as marked by the inability of tissues to synthesize DNA. Analysis of ribonucleic acid metabolism of Cecropia pupae revealed that different tissues are "turned off" at different stages after pupation and that some remain active. Thus epidermis and the muscles of the anterior region continue RNA synthesis for only 2 days after pupation, while fat body and wing bud continue until about 10 days after pupation. In contrast, malphigian tubules, nervous tissue and haemocoeysts synthesize RNA at a significant rate throughout the pupal life. As might be expected all tissues of non-diapausing Cynthis synthesizes RNA throughout the pupal stage.

Leach, W.M. THYMIDINE 32P. Embryos of the grasshopper (C. femoralis) and successively fixed in autoradiograms in the 1st instar. Portions of the brain and its complexes were shown to be the most active portion of the brain. The relative autoradiographic density of the brain is that of the complex consistent with the enrichment of brain in the cytoplasm.


Lima-de-Faria, A. INITIATION OF DNA SYNTHESIS IN GRASSHOPPER PURAS. Autoradiographic stripping f1 grasshopper Puras. Differentially labeled 3-12 followed by autoradiograms of Ag grains distribution. As synthesis progresses the choroaccumulate synthesize DNA. Measure sensitive automatic recording of 0.7 x 0.2 μ in the object plane of grain clusters at 3 μ intervals involved. The initiation of meiotic chromosome, but early might have the entire cell become part of the process. (CA 59: 16282, 6965d).
through all stages of male melon flowers, there is synthesized DNA throughout the different stages, as chromosomes at nuclear membrane breaks, the first metaphase or anaphase, leave the autosome, no RNA is synthesized through its entire length. (CA 80: 1984, 324.)

Lima-de-Paria, A. INCORPORATION OF TRITIATED THYMIDINE INTO METIC CHROMOSOMES, SCIENCE 130 (1959) 820-4.

Grasshoppers (Melanoplus differentialis, differentialis Thomas) were injected with tritiated thymidine (1/2 c/mc, 300 m/miu), each animal receiving 0.05, 0.04 mil. After 2-7 d the tissues were fixed, squashed and Feulgen-stained. At pachytene, the sex chromosomes in the spermatocyte form a large block of heterochromatin which is quite distinct from the euchromatin of the autosome. The hetero- and euchromatin were found to synthesize DNA at a different time, the heterochromatin synthesizing DNA later.

Lima-de-Paria, A. DIFFERENTIAL UPTAKE OF TRITIATED THYMIDINE INTO HETERO- AND EUCROMATIN IN Melanoplus AND Scala. J. biophys., biochem. Cytol. 6 (1960) 477-86.

Grasshoppers (M. differentialis) were injected with tritium-labelled thymidines. At intervals autoradiographic stripping film was applied over Feulgen squashes and sections. In this species during early prophase of meiosis the sex chromosomes form a heterochromatic block large enough to be resolved in autoradiographs. A study of the squash preparations reveals that the sex chromosome is synthesizing DNA at a different period of time from the euchromatic autosome. Since there is a developmental sequence of spermatocyte cycle along the testicular tube it is possible from the sections to show that the heterochromatin synthesizes DNA faster than does the euchromatin. Corresponding studies were carried out on Scala. The asynchrony of synthesis was found to occur within each chromosome in eye. Counts of Ag grains disclosed that the number of grains per unit area was 2-8 times higher over the heterochromatin. To check the DNA content, Feulgen photometric measurements were made of Melanoplus at the same stage. The Feulgen and grain counts agree in showing that the heterochromatin contains 2-3 times more DNA per unit area than the euchromatin. (From auth.)


Autoradiographic stripping film was applied over Feulgen squashes and sections of spermatocytes of the grasshopper M. differentialis after an injection of tritiated thymidine into the body cavity. Tissues were fixed 9-15 d following injection. In chromosomes at late pachytene the labelling was found to occur in clusters of Ag grains distributed along the entire genome of the chromosomes at ca. 3 μ-intervals. As synthesis progresses the chromosomes get heavily labelled, and finally the number of grains taper off until synthesis ends. Measurements of the amount of DNA along the chromosome were made with a highly sensitive automatic recording micropuncture meter, with a photocell aperture corresponding to 0.9 X 3.7 μ in the object plane. Absorption was measured along 1.8 μ-segments. The occurrence of grain clusters at 3 μ-intervals was not correlated with a higher DNA content of the chromosome segments involved. The initiation of DNA synthesis does not take place simultaneously along the whole melanotic chromosomes, but rather occurs at specific sites. Crossing-over between genes may more easily take place at sites where DNA replication is initiated.

Lima-de-Paria, A. METABOLIC DNA (DIOXYRIBONUCLEIC ACID) IN Tityus serrulatus. Chromium Oxidations. Chromosoma 13 (1962) 47-59. (In English.)

In T. serrulatus females a Feulgen positive body is present in the oogenetis and oocytes nuclei. By metaphase I the body is not seen. Injection of thymidine into the larva leads to a heavy labelling of the Feulgen-positive body. The body is found to synthesize DNA at a different period of time from the chromosomes, and there is an intermediate period when the synthesis of the two nuclear structures overlaps. The thymidine is released from the body between the 3rd and 4th h of pupal life. At this time the yolk granules in the cytoplasm become particularly conspicuous. When the body dissintegrates, the labelled material...
becomes easily diluted. The volume of the nucleus and of the cytoplasm are sufficiently large to dilute this material in such a way that it becomes indistinguishable from background radiation. Spectrophotometric measurements of the body reveal that it contains 4 times more DNA per unit area than the chromosomes. The amount of DNA in the body is of a higher order of magnitude than that found in all the chromosomes. This large amount of DNA becomes suddenly available either to the chromosomes or other cellular components. DNA can carry its own genetic information to other cellular components. (CA 87: 11684a)


Whole cysts of the testicular tubes of H. differentialis are disintegrated, giving rise to large fleshy-positive bodies. The disintegration affects all the nuclei of a cyst. The fleshy-positive bodies are strongly labeled with H²-thymidine. Spectrophotometric measurements reveal that the bodies contain 3.5 times more deoxyribonucleic acid (DNA) per unit area than the autosomes of normal spermatocyte nuclei on an equal amount of DNA per unit area as the sex chromosomes of the same nuclei. This regular disintegration of spermatocytes is not considered a pathological condition but as an adaptation by which large amounts of DNA are easily released at a convenient time of development. (CA 87: 11665a)


Posterio silk gland of Bombyx mori was homogenized, centrifuged (15000 g, 3 h), the supernate adjusted to pH 6, the precipitate chromatographed on a DEAE-cellulose column, and activating enzyme (1) eluted by 0.1-0.3M KCl. I catalyzed incorporation of glycine-U-C⁴[II] into aminoacyl-t-RNA in the absence of adenine triphosphate, Hg and t-RNA. I was highly specific for II incorporation and did not incorporate any significant amount of both C⁴- and C⁴-t-RNA. Under similar conditions II was not appreciably incorporated into high molecular weight (microsomal) t-RNA. (CA 87: 11656b)

361 Max-Planck-Institut für Biologie, Tübingen, Germany. ABTEILUNG REERMANN (Pelling). Naturwissenschaften 49, 18 (1962) 960. (In German)

The incorporation of H²-uridine as radiactive RNA-units into the Balbiani rings of the salivary gland chromosomes of Chromostoma tartan may take place simultaneously with thymidine incorporation in DNA. Autoradiographs, however, indicate a drop in RNA synthesis during DNA replication so that the possibility of an interference of the two processes can not be excluded.


Incorporation and resorption of adenine-⁸-C⁴ and of P⁴-C⁴ by nucleolar, chromosomal and cytoplasmic RNA have been studied. Radioisotope concentrations were determined from autoradiographs, by grain counting, and RNA concentrations by microhemometry after basic staining. The relation between rates of RNA accumulation and rates of adenine incorporation was used to determine if synthesis was used to replace RNA which was lost from a fraction, and to obtain estimates of turnover rate. Nucleolar incorporation patterns indicate its incorporation is independent of growth, and there is complete turnover of the fraction in an hour or less. Nucleolar turnover is attributed to degradation of RNA within the nucleus rather than to movement of intact molecules from the nucleolus. Chromosomal RNA reaches a much lower maximum specific activity than nucleolus, and a slightly higher maximum specific cytoplasmic RNA. It showed faster incorporation than cytoplasmic RNA while accumulating RNA at the same rate as the cytoplasm, suggesting chromosomal RNA turnover. No evidence of cytoplasmic RNA turnover was found; rate of incorporation and rate of growth were correlated, and retardation studies detected no decrease in amount of RNA-C⁴, RNA-P⁴, or RNA. Different ultimate precursors are indicated for nucleolar and non-nucleolar RNA by the observation that the nucleolar precursor is labelled before the precursor of non-nucleolar RNA.

(Auth.)


In 2nd day larva salivary gland 90% of activity/hr. +


In the process of lacking associated with the with euchromatic and hetrochromatic DNA, in addition to that of the RNA, is sensitive to b epiradiation of the DNA, and RNA incorporating T RNA is sensitive to marked increase in ribonucleoside. The nucleotide digestion. These data exhibit many of the prop. adult males that were not examined. The DNA is not identical. The major dif is that of the 5-10% incorp. since the incorporation of the data in both tissues does not conta.

365 Mead, C.G. A DNA-AS "Research and Developments Technical Information, A DNA-associated RNA has properties inhibited by this in the transfer of genetic information. The deoxyribonucleic acid is that of deoxyribonucleic acid or the adenine purine increased (2P°C) after reino was found to be highly distinguishable by their natu.

366 Moguchu, T., Shigemuro, TRACING 5-36 AND 5-90 Japan Conference on Radio Microscopy and Radioisotope Carbohydrate, disphagn and their metabolism, this metabolism was determined. The results show that the c especially RNA and the act.

367 Pelling, C. APPLICATION: ASPECTS OF THE METABOLIC Physical and Biological Sci International Atomic Energy The investigations were can compounds, ⁸-thymidine, should indicate the place of glands autoradiographs of if chromosomes are most suit DNA-synthesis (thymidin), by determining the time at
am are sufficiently large to dilute background radiation. Spectrophotometric analysis of the DNA peak area indicated that the chromosomal DNA is unique to the chromosomes or other cellular nuclear components (CA 57: 1962).

SPERMATOZYGES IN Melanoplus sanguinipes

Living large male Feigen-positive, non-sperm-positive bodies are strongly

ated that the bodies contain 2, 8 times normal spermatocyte nuclei on an

is nucleus. This regular disintegration in adaptation by which large amounts

Ca 57: 1962, 11859)

CHOLIC ACID (C4-RH)

The supernatant was column, and activating enzyme

labeled the site for H incorporation and did not exhibit conditions for lack of RNA (CA 59: 1962, 166593)

BEERMANN (Reeling, Networt.

quent rings of the salivary gland chromosomes incorporated into DNA. Auto-

in the possibility of an

ZOAR: CHROMOSOMAL AND CYTO-

mately, a new perspective for the RNA is a principle for the RNA serving as intermediate in the transfer of genetic information. The ratio of DNA/RNA was 9:1 on a molar nucleotide basis. The molar nucleotide composition of the RNA was similar to that of DNA (repeating T with T) and distinct from that of microscopically visible RNA. Treatment with RNase, DNase, or by heat denaturation altered the sedimentation properties of the RNA-RNA complex. The RNA of the DNA, however, was only slightly increased (5%) after removal of the RNA with RNase. The RNA also has an RNA with a higher activity toward RNA synthesis, and two types of RNA were distinguished by their relative metabolic stabilities, both of which were associated with the DNA.


Microautoradiography and biochemical analysis were used for studying the effects of diphenyl salicylic, diphenyl carboxyl, diphenyl sulfone and other on metabolism. 


The investigations were carried out on the salivary gland chromatin of Chironomus tentans. Tritiated compounds (H-3 thyminde, H-3 uridine, H-3 amino acids) injected into the haemolymph of the larvae should indicate the place of incorporation within the giant chromosomes. After fixation of the salivary glands of specimens of the quash-preparations were made. The autoradiographs show that giant chromosomes are most suitable for localizing the activity at chromatin structures with high resolution. DNA synthesis (thyminde), RNA synthesis (uridine) and protein synthesis within the cell could be followed by determining the time and, approximately, the quantity of incorporation contrary to the protein.
synthesis, the DNA-synthesis and the RNA-synthesis are restricted to the chromosomes. The essential physiological activity of the chromosomes seems to be represented by RNA synthesis which takes place at certain distinct loci (nucleolar organizers, "Salivary-stages", pre- and other chromosomal bands). The report discusses some features of RNA synthesis. (From auth.)

332


Salivary glands from larvae of various stages of development and incubated in vitro in a medium also containing tritiated thymidine. The appearance of discernable labelling sites on autoradiographic preparations of pulse-labelled Drosophila salivary gland chromosomes indicates the presence of several independent points of DNA synthesis along the length of these polymere structures. While subjects to an alternative interpretation, the data are more simply reconciled with the presence of several molecular ends in the DNA complement along the axis of each chromosome arm. (Auth.)

333


Larvae of Chironomus were placed in solutions containing 1H-thymidine or injected with small quantities of the solution. The salivary glands and Malpighian tubules were dissected, fixed in acetic acid-alcohol and autoradiography prepared with stripping film. Labelling of the nuclei of the cells occurred sparsely in both tissues. In some of the nuclei the chromosomes were labelled approximately in accordance with the amount of DNA in the various parts. However, in many nuclei parts of the chromosomes complement incorporated the label. These parts were either large sections of a few chromosomes, many different bands or groups of bands, or in some instances very small regions of one or a few bands to which the label was restricted. The observations can be accounted for by asynchronous duplication of the various regions of the chromosomes. However, the lack of any uniform pattern of incorporation among the cells of a gland appear to be incompatible with suggestions of a special functional significance to the synthesis of DNA at loci in giant chromosomes. (Auth. summary).

334


By Senkam staining and autoradiography of the giant chromosomes of Tomespis plumosus, evidence was obtained for 2 kinds of DNA, one kind is associated with the hereditary units (chromosomes) and the other is extrachromosomal. The first type may be found in the nucleoplasm surrounding the chromosomes and in some cases appears to be extruded from the nucleus into cytoplasm. The extrachromosomal DNA does not appear to be associated with particular structural units, as seen by electron microscopy of autoradiographs. (CA 68: 11727g).

335


The larvae were exposed for 2 1/2 hours to 1H-thymidine (specific activity 1.2 me/ml: 60 mc in 10 ml of tap water). The synaptic of the salivary-gland chromosomes of Stomatocoris larva is incomplete at some point although the disc pattern on each homologous chromosome is region where they are lying side by side appears the same. In linear as well as lateral patterns of organization the different parts of a chromosome exhibit asynchronous behaviour in DNA synthesis. Where a gap in epitys (i.e., where the pairing of the 2 homologous chromosomes is incomplete) each homologous part incorporates H-thymidine independently so that in some cases the homologous regions of the homologous chromosomes united in one giant chromosome show differences autoradiographically, which may help in investigations into the activity of allelic genes combined in one giant chromosome.

336


The salivary-gland chromosomes of diploycr larvae (at any rate, of Diptera family) and Chironomus plumosus reach their final stage of development in the pupal stage. Multiplication of chromosomes of the giant chromosomes does not occur in pupae. On contrary, their size is reduced and their disc pattern becomes invisible. An attempt has been made to incorporate 1H-thymidine into the salivary-gland chromosomes of pupae, so state of being digested and 1S, 28, and 27 old. While would not incorporate the 1H-thymidine as apparently not related to nm.

337


338


Radiographic study of nuclear female cichlids shows that the cryptochrome I is rapidly f 1 in the cytoplasm of the 150/460.

339


Uridine-1H was injected into fish brains were removed after 1 ms and incorporated into cytochrome was almost a.

340


EGG SPYX O (CHRONOMICRA). Exp. C.

Early preps of fish with the salivary gland is one of the most resistant parts of the organism to effects of radiation. (Uridine and 8-1H is more effective than 350 and 360 or described and of the is observed).

341

Sestó, J. L., Jacob, J. CE ACID (R). Exp. Cell Re.

Female D. melanogaster were non-radioactive orotic acid, follicle cells showed that rich with chromatin. (CA 88: 113.8.20.)
chromosomes. The essential DNA synthesis which takes place at other chromosomal bands. The

DNA CHROMOSOME OF

and incubated, in vitro at

be labelled sites on autoradiographs indicates the presence of polyene structures. While subject

with the presence of several molecular (Avsh.)

GIANT CHROMOSOMES OF

Hep. 9 (1961) 253-3, (In

or injected with small quantities of

labelled, fixed in acetic acid-alcohol

t solution occurred sporadically and in accordance with a few chromosomes, many different or a few bands to which the label duplication of the various regions correspond among the cells of a gland

DNA AND CHROMOSOMAL USING TRITIATED THYMIDINE

uniparous examples, evidence was

secret (chromonema) and the

the region surrounding the chromosomes.

in. The extrachromosomal DNA was

used by electron microscopy of

MOLOCOSUS GIANT CHROMOSOMES


by 1.5, 1.0 mg/ml: 66 µg, 16 ml

larvae in insemination at some times when they are lying side by

the different parts of a chromosome exists (i.e., where the

part comprises H-thymidine and polyene chromosomes united in one

in investigations into the activity

METABOLIC DEOXYRIBONUCLEIC

did not shift (1963) 157-64.

epididymis melanogaster and Chironomus

Multiplication of chromosomes of the salivary gland

and 7H-thymidine into the salivary gland

chromosomes of pupae, to test whether DNA synthesis occurs at those chromosomes which are already in a state of being digested and no longer multiply. H-thymidine was injected into pupae 15, 22, 26, 34, 35, 38, and 37 b old. While some regions were highly radioactive other parts of the same chromosome would not incorporate the label. It appears that some regions of the chromosomes are still capable of incorpo-

rating H-thymidine and of synthesizing DNA during their digestion in pupae; DNA synthesis is thus apparently not related to multiplication of chromosomes.


It was demonstrated by means of autoradiographs that the physiological condition of a giant chromosome along its length is not the same and that the uptake of such substances as H-thymidine, H-adenosine, H-ps, H-glu,

etc., varies from region to region of the same chromosome; from chromosome to chromosome in the same nucleus; in comparison of homologous chromosomes, from nucleus to nucleus in the same specimen; from tissue to tissue in the same larva; and from larva to larva, even when of the same age. Each homolog appears to be acting as a physiological unit in the lateral organization whereas the activity of each daughter chromosome is generally marked for they have the same gene locus. Different degrees of incorporation of labelled substance may sometimes be correlated with morphologically distinct parts of the chromosomes.

Cytological studies have shown bands to separate DNA.

Sengin, A. STRUCTURE AND FUNCTION OF THE GIANT CHROMOSOMES. (Abstr.) p. 219 in "XVI


See 343.

Södéro, C., Durand, M. INCORPORATION OF TRITIATED ADENOSINE IN THE OVARY OF THE CRICKET


Radiographic study of radioactive acids isolated from the ovary after injection of tritiated adenosine in the female cricket shows that the precursor of ribonucleic acid (1) accumulates in the ovary prior to synthesis, that cytoplasmic is rapidly synthesized during active protein synthesis, and that there is an accumulation of H in the cytoplasm of the oocyte when deoxyribonucleic acid levels are elevated. (CA 56: 1961, 14756d)

Södéro, C., Durand, M. INCORPORATION OF TRITIATED URIDINE INTO CRICKET OVARIAN. C.R.


Uridine-H was injected into the abdominal cavity of adult female crickets (Gryllus bimaculatus) and the gonads were removed after 24 h and examined histologically and autoradiographically. In follicular cells uridine was incorporated more rapidly into ribonucleic acid (1) than deoxyribonucleic acid. In oocytes labelling was almost entirely restricted to RNA. (CA 56: 1962, 5233b)

Sithin, J.L. CELL SITES OF RNA AND PROTEIN SYNTHESIS IN THE SALIVARY GLAND OF


Early prepuces of Simulzia sp. were injected ventrally in the 2nd (wing) segment, where the greater part of the salivary glands is contained, with 0.01 .µg (0.01 mm²) tritiated uridine, adenosine or thymidine. (Uridine, nominally 5.6 .µg; DL-thymidine, 3H, general label; thymidine, probably 6.1H with specific activities of 6, 16.9 and 360 mc/m mole, respectively). Their uptake by salivary gland cell components is described and some of the implications mentioned. Intense local protein synthesis in cytoplasm has been observed.

Sithin, J.L., Jacob, J. CELL FUNCTION IN THE OVARY OF Drosophila, II. BEHAVIOR OF RIBONUCLEIC


Female D. melanogaster were fed for 3 h on food containing orotic acid-6-C, for 6-8 h on food with non-radioactive orotic acid. Autoradiographic scoring of the tracer in ovarian nurse cells, oocytes, and follicular cells showed that ribonucleic acid (RNA) function is intense at the point of contact of RNA masses with chromatin. (CA 55: 1961, 2264f, 2544)

109
An important amount of nuclear RNA is turned over in the nucleolus, the greatest nucleolar turnover being at the core conformed with the chromosomal nucleolar organizer. The nature of this RNA was studied by measuring the uptake of 3H-labeled nucleosides by nuclei, chromosomes, Balbiani ring, and cytoplasm of salivary glands of the chironomid Tribolium at different stages of larval growth. The pattern of pseudouridine uptake differed from that of the other ribonucleosides. The data indicated the synthesis is site of nucleolar RNA, and suggested that at least part was transfer RNA up to stage III of development. (CA 1964, 25070D)

Nuclear in situ in salivary glands of fully grown larvae (stage IV) of Tribolium sp. (Chromomidasae) were pre-treated with inhibitors: actinomycin C (Bayern), TIB (4,5,6,7-tetrachloro-3-B-D-ribofuranosyl-2-nitrobenzimidazolone ex K. Pollock), and thiosemicarbazide, followed by exposure to 3H-uridine (50 μC/cc). The three classes of inhibited nuclei produced by actinomycin C and TIB, and the two classes produced by thiosemicarbazide are described. Nuclear RNA has a transcriptive tumour with the dense particular at the origin determining either a centrosomal or centromeric stable pattern. The centrosomal tumour pattern used in this work lends itself to inhibition studies. The studies indicate an autonomic and an intranuclear RNA, the former being chromosomal messenger RNA, Messenger RNA, and not organizer RNA, primes taurismic molecular RNA. Free messenger was directly observed in the nucleus and followed to cytoplasm.

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Basal salivary-gland nuclei of the scardid, Rhynchocnemus angustus, were isolated (by hand) and cultured in a standard medium (Proc. Natl Acad. Sci. 46: 1950, 433), at room temperature, with or without polyvinylpyrrolidone, at an empirical 2.5% concentration (PVP-medium). Isolated nuclei were cultured with tritiated guanosine, cytidine or uridine added at 40-150 μC/cc, for 20-30 min. In some experiments the nuclei were pre-cultured in the presence of inhibitors added to the media and then incorporated into the radioactive medium, or these compounds were offered together with tracer. The processing for autoradiography is described. Non-isolated nuclei in the cultured twined gland were the controls. Incorporation by the glands appears in vivo in vivo, Isolated nuclei and controls have a similar pattern of nucleotide incorporation but differ for uridine acid (leucine). Uptake of nucleotides in isolated nuclei is greater in macromolecular and unorganized nucleolar masses than in chromosomes (pre-altered, respectively). Incorporation of guanosine is reduced by pre-treatment with 4,5,6-trichloro-o-fluoroanisylaminothymidazole (0.05 mg/cc) or co-treatment with actinomycin C (3.0 mg/cc). Uptake of leucine in non-isolated nuclei, presumably in protein, is slightly greater in nucleolar material than in chromosomes, the reverse applying for isolated nuclei. Co-treatment with purino (0.03 mg/cc) seemingly inhibits incorporation.

Chase experiments were performed on nuclei of Rhynchocnemus angustus pre-incubated with tritiated guanosine (0.2 mM) in 2.5% polyvinylpyrrolidone (PVP) medium for 30 min. The nuclei were then incubated for 3 h in 3 alternative media with 10-fold excess adenine and guanosine added: (1) standard medium, (2) PVP-medium, and (3) PVP-medium with 0.2 mM 3-3 dichloropropionate (DNP). In (2) a loss of 1/3 of their RNA label in chromosomes and nucleolar material was observed, compared with controls. DNP slightly inhibited label. Pre-treatment of nuclei with dithiothreitol buffer (pH 4.0) in (2) lowered the subsequent uptake of cytidine or guanosine offered in (2), and chromosomes were damaged. When both buffer and tracer were each offered in (3) the incorporation of leucine mainly into protein was not inhibited. Pretreatment with DNP or ethionine bromide (20 μC/cc) had no effect on cytidine uptake when PVP was present throughout incubation. Co-treatment with 5-fluorouracil (1.0 mM) inhibited uridine uptake, preventing the formation of nucleolar material in the chromosomes. This suggests alteration of RNA through competitive uptake between analogues and nucleotide, which is supported by the actual incorporation of 5-fluorouracil-2-C14. PVP was found to protect against uptake inhibition and to promote release of nuclear RNA when present throughout all incubation steps. Pseudouridine C (7,8-fold excess; ex W. E. Cohen) when offered simultaneously with tritiated uridine had no effect on uptake. The absence of organizer results in a periphas (coreformed) pattern of nuclei.


454 Sinits, I. L. ADDENDUM TO Cell Res. XIV. Cell Res. Further sections deal with mechanical aspects of the nucleus.


110


454 Sinits, I. L. ADDENDUM TO Cell Res. XIV. Cell Res. Further sections deal with mechanical aspects of the nucleus.


organizer results in a peripherally disposed dense-particular nucleolar region which determines a directional (constricted) pattern of nucleolar RNA turnover with its origin in that region.


Comprehensive review article, divided into parts on the biology of the nucleolus (physical aspects, studied microscopically and submicroscopically: nucleolus, nucleolar organizer, nucleolus-associated chromatin; physical-chemical and chemical aspects: RNA, DNA, proteins, enzymes, lipids, carbohydrates, minerals; physiology, status of cell, nutrition, turnover; pathological and experimental alterations; behavior during mitosis, and mode of formation) and its function in terms of enzymes, RNA, transfer RNA, template RNA, the nucleolar organizer, proteins, ribosomal proteins and spindle proteins. - Figure 4, 1-6 have proved particularly useful in RNA turnover studies (nucleolar and nucleolar RNA, and intranuclear RNA). -- References: p. 29-66, the present bibliography being only concerned with a few of them.


Further sections deal with morphology, tumors, nucleolar-associated chromatin, and biochemical and mechanical aspects of the nucleolus. An extensive bibliography is given.


Safflower glands from larvae of Carapa parishensisparis in stage III were incubated in vitro under a variety of conditions: with tritiated thymidine; with tritiated thymidine and acridine orange. In the presence of profafin in the dark, with tritiated thymidine added at one stage. The incorporation of thymidine into DNA in the chromosomes (including the organizer) was very strong, while no incorporation was shown by nucleoli except rarely. Profafin totally inhibited nucleolar RNA synthesis and only partially inhibited chromosomal RNA. The organizer incorporated dyes to about the same concentration as the other chromosomes. Acridine orange inhibited the incorporation of thymidine into nuclear RNA as described for profafin. These inhibitions were also observed with tritiated thymidine. The synthesis of nucleolar RNA (nucleolus) appears to begin in the nucleolar proper and is dissociable from the synthesis in the organizer, a conclusion which may be generally valid. Whatever relationship exists between nucleolar RNA and organizer DNA it is not different from that which exists between nuclear RNA and other (not necessarily all) chromosomal RNA.


Stained glands of the chromosomal Silusita were cultured in vitro in a synthetic medium containing [1H-C-METHYL] METHIONINE to NUCLEOLAR RIBONUCLEIC ACID. Biochem. J. 57 (1955) 479.

Salivary glands of the chimpanzee Silusita were cultured in vitro in a synthetic medium containing [1H-C-METHYL] METHIONINE to NUCLEOLAR RIBONUCLEIC ACID. Results showed that, in contrast to the incorporation of C14, the incorporation of these nucleic acids into the nucleus was inhibited by puromycin. Ribonucleic acid competitively inhibited the incorporation of [1H-C-METHYL] METHIONINE to NUCLEOLAR RIBONUCLEIC ACID. The methylated bases are characteristic of transfer RNA, as previously suggested from the incorporation of pseudouridine (see 349).


Drosophila chromosomes were labelled with thymidine-1H. Distribution of radioactive RNA (deoxyribonucleic acid) was studied by quantitative autoradiography. Stained chromosomes were examined for distribution of radioactive activity from tritium-1H particles over bands and interbands (in overlying Ag baselum emulsion). More radioactivity was found in the bands than in the interbands. The level of radioactivity in the interbands did not exceed background counts in the nucleoplasm. The majority of evidence indicated that DNA was not present in the interbands. (CA 80, 1994, 2991a)


The pattern of incorporation of 32P-O2, cytidine-1H, and guanosine-1H was examined in cells of onion and broad-bean rootlets and salivary glands of the chimpanzee Silusita. The former 2 types of cells showed
heavy labelling of nucleolar RNA when nucleoside-1H was added, while nucleolar RNA was relatively inert with respect to 14C. Frequently a ring of chromatin surrounding the nucleolus showed marked incorporation of 14C. A sluggish nucleolar 1H turnover was also observed in spermatids. (CA 56:1962, 13283b)


Histological and autoradiographic techniques demonstrated that DNA was synthesized in the nuclei of the ovary, fat body, and midgut. There appeared to be a transfer of some of the DNA to a partially denatured form from the ovarian trophic tissues to the growing oocyte. RNA was synthesized in the nuclei of the ovary, fat body, and midgut, and then transferred to the cytoplasm. Some of the RNA passed from the ovarian trophic tissues to the growing oocyte. Protein was synthesized most actively in the ovarian follicular epithelium, and in the fat body. Newly synthesized protein was transferred from the follicular epithelium to the oocyte. Synthesis of yolk protein by the oocyte itself appeared to be negligible. (Author)


H²-thymidine was incorporated into young larvae of Drosophila melanogaster by placing them for varying periods in a medium consisting of 0.18 g of standard cornmeal, molasses, agar mixture, 0.06 g of yeast and 29.4 mg of H²-thymidine, with a specific activity of 244 mc/mg in one series of experiments and 1800 mc/mg in another. Autoradiography was used, also phase contrast microscopy for fine structure, particularly of the innermost region. Findings on the lateral and linear patterns of organization in fully developed chromosomes of the salivary gland are consistent with the view that (1) DNA occurs as a unit which traverses the bands and extends along the full length of the chromosome; (2) the unit occupies only a small part of the cross-sectional area of the chromosome and therefore constitutes a single strand among many; (3) this entity remains intact during succeeding replication (except for possible interstrand exchanges); and (4) DNA may not be distributed uniformly along the strands, because radioactivity appears to be concentrated primarily in regions that correspond to the bands.


Precursors for proteins (DL-leucine-4, 5-14C, 2670 mc/mg) and for ribonucleic acid (uridine-5, 6-14H, 640 mc/mg) were injected into adult, egg-laying Drosophila melanogaster. Similar experiments were made with larvae of the 3rd instar at the age of 1 d before metamorphosis. The technique is described. The occurrence of heavy incorporation of H²-labelled uracil in the cytoplasm before noticeable incorporation in the nuclei indicated that cytoplasm is the main site of protein formation. The experiments give further support to the hypothesis of the nuclear origin of RNA.


Comprehensive review article, including autoradiographic data obtained for Drosophila (p. 91-4), Bombyx mori (p. 94), Chironomus (p. 94), Bombyx mori (p. 123), and Malecostoma americana (p. 107-8).


The incorporation of H²-uridine into RNA of oocyte nuclei of Blatella germanica was studied by autoradiography. When oocytes were incubated in H²-uridine for 4 hours in 10 ml, the newly formed, labelled RNA appeared in both nucleoli and chromosomes. Nucleolar RNA was first observed in several spots at the periphery of the nucleolus. After one hour or longer incubation the nucleolus became uniformly labelled. These observations indicate that nucleolar RNA is produced at the periphery of the nucleolus, where the presence of DNA could be demonstrated. It is probably not the nucleolus itself which produces nucleolar RNA, but this DNA base Acetomycin D showed tRNA molecules were labeled. Unlabelled, while cytoplasm concentrations (10 µg/ml) of RNA (tRNA) appear the of RNA, produced by an RNA into the c

See also:

111 Biochemistry of d
163 Transmission of p
511 Incorporation of F
211 Study on the bint.
222 Synthesis of tRNA
263 Electron microscopy

161 The role of the bint.

418 Timing of spermatogenesis
419 An autoradiograph
1906
422 Nucleotides and c
423 Nucleotides and c
424 Cell function in d
442 Low incidence of
443 Fertilization in D
444 Fertilization in D
476 The genetic factor
477 Metabolic effect
478 Inheritance of
985 Chromosome split
1191 X-ray-induced lac
1192 X-ray-induced lac
1544 Progress in tetr

1-9-61


Sterols were extracted from a silicate acid-cellulose c in the same chain where the be are recovered from acid-cellulose c be the same in each case the side chain that the 1,2-C(6)OH of to 1 when eggs were hatched.
RNA, but this DNA belonging to the chromosomal regions adjacent to the nucleus. Experiments with Actinomycin D showed that this DNA is functionally different from DNA in the rest of chromosomes. When oocytes were incubated in H\textsuperscript{3}-thymidine in the presence of 2 \( \mu \)g/ml of Actinomycin D, nuclear remained unlabelled, while chromosomes became labelled nearly as strongly as in the absence of the drug. At higher concentrations (10 \( \mu \)g/ml) Actinomycin D inhibited both nuclear and chromosomal RNA production. In conclusion it appears that the nucleus serve as intermediate storage or processing place for a certain kind of RNA, produced by particular regions of chromosomes. The problem of transfer of chromosomal and nuclear RNA into the cytoplasm is now being studied by inhibiting new RNA formation with Actinomycin D.

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See also:

151 Biochemistry of dispartus, development, and injury in silkworm pupae. (Wyatt, 1965)
153 Transmission of phosphorus-32 incorporated by parents into descendants of \textit{Drosophila melanogaster}. (Fahidi et al., 1981)
185 Incorporation of \( ^{14} \)C into the phosphorus compounds of the wax moth larvae. (Wlodawer, 1966)
211 Study on the biosynthesis of proteins in \textit{Drosophila melanogaster}. (Bremner-Joschek and Luebbers, 1969)
225 Synthesis and breakdown of proteins and ribonucleic acid in Tribolium confusum. (Dey et al., 1965)
285 Electron microscopical and some biochemical studies on the cell fractions of silkworms. (Sadaharu and Saito, 1961)
301 The role of the glandular hormone in the synthesis of protein and RNA (ribonucleic acid) in silkworm pupae. (Yasuda, 1967)
418 Timing of spermatogenesis in \textit{Drosophila melanogaster} using tritiated thymidine. (Chandley and Bateson, 1962)
419 An autoradiographic study of wound healing in dispartus silkworm pupae. (Davis and Schneiderman, 1969)
421 Nucleotides and other phosphorus compounds of cockroach nerve. (Heaslop and Ray, 1960)
422 Nucleotides and other phosphorus compounds of the cockroach central nervous system. (Heaslop and Ray, 1961)
462 Cell function in the ovary of \textit{Drosophila}. 1. Deoxyribonucleic acid (DNA) classes in same cell. (Reese and Stoller, 1969)
475 The genetic effects of labelled DNA precursors. (Kaplan et al., 1969)
777 Mitotic effect of \( ^{32} \mathrm{P} \) and \( ^{35} \mathrm{S} \) labelled DNA precursors injected into \textit{Drosophila melanogaster} males. (Stetnens et al., 1969)
986 Chromosome splitting as revealed by combined X-ray and labelling experiments. (Wolf, 1983)
119 X-ray induced incorporation of tritiated thymidine into grasshopper neuroblast chromosomes. (McGinnis, 1969)
1192 X-ray-induced incorporation of tritiated thymidine into deoxyribonucleic acid of grasshopper neuroblast chromosomes. (McGinnis, 1969)
1544 Progress in tritium autoradiography. (L'Insie-de-Pulka, 1962)

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I-B-6 LIPIDS, STEROL AND STEROID METABOLISM

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Sterols were extracted from \textit{Mucrophyx striolus} and purified by digitonin precipitation and chromatography in a silicic acid-cellulose column with a gradient of isopropanol C and hexane for elution. These sterols were recovered from adults and eggs and from larvae and pupal cuticles. The major sterol, designated \textit{mucosterol} \( \text{O} \), differs from cholesterol only in the side chain where the isopropyl structure is missing. The side chain of \( \text{O} \) (starting at C-36) appears to be either \( \text{CH}=(\text{CH}_2)_{18} \) of the \( \alpha \) or \( \beta \) form of \( \text{CH}=(\text{CH}_2)_6 \). There was little or no conversion of cholesterol to \( \text{O} \) when eggs were incubated in a medium containing \( \text{O} \)-labelled cholesterol acetate. (CA 66: 1961, 196804.)

Sterols (I) were extracted from whole adult Musca domestica and their papal ovaries. The 1 were separated into fractions by chromatography, and individual 1 were identified by chemical and physical means including optical rotations, x-ray diffraction patterns, and infra-red and nuclear magnetic resonance spectra. The major sterol, muscaterol (II), was present throughout the life cycle. Extensive data are given on II whose structure is only partly elucidated. II has many similarities to cholesterol but probably differs in the position of substituents in the saturated side-chains. In metabolic tests, no cholesterol-4-C\(^{14}\) appeared to be incorporated into II. The precursor of II may have been a phytosterol supplied in the food. A compound similar to methylsterol was found in the larvae and papal ovaries, but it was not detected in the eggs or the adults. 2 mole sterols (A and B) were eluted from silicic acid-cellulose columns in the positions of A' cholesterol and B' dehydrocholesterol, respectively. Sterol A appeared to be mainly A' cholesterol and sterol B, a C\(^{4}\)-sterol. (CA 67: 1265, 1335).


The nature of the sterols present in the various developmental stages of Musca domestica was investigated. The in vivo synthesis of cholesterol C\(^{4}\) and hydrolysis of cholesteryl C\(^{4}\) acetate in Musca domestica and Periplaneta americana was studied. Hydrolysis was more rapid when saturated, and the more active than the fly in this respect. In both cases a "cholesteryl-like" sterol, more polar sterols and a stereryl ester less polar than cholesteryl acetate were recovered. The in vivo balance of sterols and esters was found to be disturbed by cholesterolytic and DDT (2,2-bis-(p-chlorophenyl)-1,1,1-trichloroethane). Metabolism of cholesteryl C\(^{4}\) acetate was studied in a complete life cycle of the fly. A predominance of polar C\(^{4}\)-labelled sterons was formed in the egg, larva, pupal exuviae and adults. Nymphs of P. americana were similarly studied. The major sterol was again not cholesterol but was slightly less polar. In contrast to the fly, however, the nymph major sterol appeared to be formed from cholesteryl. Other sterols behaved similar to A'-cholesterol and possibly B'-dehydrocholesterol in chromatography and the Liebermann-Burchard reaction. A fast chromatographic fraction representing both normal and C\(^{4}\) sterols material of more polar sterons. It appears that cholesteryl is converted into cholesterol in their major sterons, more polar sterons, and a "cholesterol-like" sterol which is excised in the faeces.


Cockroaches were fed a series of diets containing C\(^{4}\)-cholesterol. A general procedure for the isolation of cockroachsterol ester II described and the results are tabulated. The major sterol ester of II, borrelina (ester on diet) is cholesteryl acetate. (Diet) consisted of the semi-synthetic diet of Nelson and Beaman, cf. Proc. Soc. expo, Biol., N.Y. 70: 1940, 198, in which the corn oil had been replaced by commercial sodium acetate; it also contained, in addition, 0.1% C\(^{4}\)-cholesterol. The remaining sterol esters appear to consist principally of lineoleate and a small smarason ester fraction in which palmitole is the principal component.


A study of the phospholipids of the fly was made because of the possibility that some alteration in membrane structure or active transport is implicated in the development of resistance to insects. The phospholipids of a diethylresistant strain of housefly and of a susceptible strain from which it was derived were labelled by feeding the flies on phosphatidyl choline solution for 24 h and then allowing them to metabolize the absorbed phosphate for periods up to 36 h. Thoracic ganglia were removed and the phospholipids separated by chromatography on silicic acid impregnated paper strips. Four major phospholipid fractions can be separated which appear to be the same as those obtained from extracts of whole flies. In the case of whole fly extracts the identity of the fractions is as follows: fraction I phosphatidyl choline, fraction II phosphatidyl ethanolamine, fraction III phosphatidyl serine, and fraction IV phosphatidyl ethanolamine and phosphatidyl serine. Fraction I consists of non-phosphatidyl phosphorus-containing compounds. Maximum labelling of the fractions was obtained after feeding the flies on glucose and water for one week after removal from the 14C-phosphate. The distribution of the 14C activity in the separated fractions from the ganglia of the resistant and susceptible fly showed no significant differences at the time of 14C-activity into the two more obvious when the flies were on diets richer in 14C-phosphate or labelled phosphatidyl ethanolamine. The relative amount of phosphatidyl ethanolamine in the resistant fly was significantly lower compared with the susceptible fly. (CA 70: 1303, 1304).

370 Chojnacki, T., Piekoszewska, Of P\(^{32}\)-PHOSPHOCHOLINE. (1961) 187-98. (in Polish)

A molecule of phosphocholine incorporation into p\(^{32}\)-phosphate stages of the insect growth, and moth. The incorporation rise, is also in moths /9/0:}

371 Chojnacki, T. KISOKSYNTETEROS-PHOSPHATIDYLCHOLINE. (in Polish, with English summary)

The course of incorporation Maximal specific activity of p\(^{32}\)-phosphatidylcholine C\(^{32}\)-phosphate, C\(^{32}\)-phosphate and C\(^{32}\)-phosphate and C\(^{32}\)-phosphate is reached. The course of incorporation of lecithin. The biosynthesis of phosphatidylcholine from prostacyclin of p\(^{32}\)-phosphate local accumulation of p\(^{32}\)-phosphate and p\(^{32}\)-phosphate. (Auth.)


The incorporation rate of p\(^{32}\)-phosphatidylcholine and p\(^{32}\)-phosphatidylcholine are precursors of lecithin. No invalidation of degree of fatty acyl substitution.

373* Clayton, B.B., B. BLOOM (germania). J. Mol. Cell. A group of 200 adult moths of the species L. C\(^{1}\)-C\(^{1}\) (1). Since the conditions could be shown to be material from esoprogastres and 

373* Clayton, B.B., Edwards, A BLOOM. Res. Commun. 6 (2) 1962-63. (in Polish)

The species of Periplaneta, concerned for the first time with the second sterons and C\(^{1}\)-C\(^{1}\) (15). All the times of Periplaneta, contained p\(^{32}\)-cholesterol. Chlorophyll content of carbohydrates in the diet of B (geriatric care)
differences at the time of maximum labelling. There was, however, some evidence for a slower turnover of $^{3}H$ activity into the two major phospholipid fractions (IV and V) from the resistant fly. This was made more obvious when the flies were fed on milk in addition to glucose and water. Preliminary studies on turnover for much shorter periods were carried out on phospholipid fractions from whole flies injected with $^{3}H$-labelled orthophosphate solution. These showed a more rapid turnover of $^{3}H$-activity into the phosphatidyl ethanolamine fraction (IV) in the case of the resistant flies, although in these short-term experiments there seems to be no difference in turnover into fractions IV and V from the two strains. The possible significance of the findings is discussed. (Auth.)


A molecule of phosphocholine takes part in biosynthesis of lecithin in *Celaria euphorbiae*. The rate of incorporation of $^{32}P$-phosphocholine when followed in homogenates of fat body is not equal in various stages of the insect growth. It is the highest in caretallaria, while it is a slight one only in spinula, pupa and moth. The incorporation of labelled phosphocholine into phospholipids, when observed in vivo, is also in moth 1/3 of that in feeding caretallaria. (Auth.)


The course of incorporation of $^{32}P$ into phospholipids of the *Celaria euphorbiae* male moth was investigated. Maximal specific activity of phosphatidyl fraction was found about 12 h after injection of labelled orthophosphate. Cephalids showed higher rate of regeneration than lecithin did. Cephalids reached their maximal specific activity within 12 h after isotope had been administered while lecithins after 56 h only. The course of incorporation of $^{32}P$ into phosphatidyl indicated that phosphatidyl might be a precursor of lecithin. The biosynthesis of lecithin in *Celaria euphorbiae* male moth has been discussed in relation to the storage of phosphatidate in its ductus excretorius and it has been concluded that the process of local accumulation of phosphatidate did not run in parallel with the rate of biosynthesis of lecithin in whole body. (Auth.)


The incorporation rate of $^{32}P$ into inositol phosphophosphate was higher than that into lecithin, phosphatidyl ethanolamine or phosphatidyl serine. The kinetics of labelling do not substantiate the assumption of lecithin or phosphatidyl serine arising from phosphatidyl ethanolamine. Phosphoryl-choline may be the precursor of lecithin. No difference was found in the incorporation rates of $^{32}P$ into lecithins differing in unsaturation degree of fatty acid molecules. (Auth.)


A group of 900 adult males were fed 10 g of artificial diet containing 0.1% cholesterol to which 30 mg of sodium acetate-1-C$^{14}$ ($1.8 \times 10^{7}$ cpm/mg) had been added. After 24 d, the diet was consumed and the insects killed. The subsequent procedure is described. The principal sterol synthesized under narcotic conditions could be shown to be 22-dehydrocholesterol. Evidence is presented for the derivation of this material from ergosterol synthesized by the intestinal flora of the insect. The metabolic conversion of ergosterol to 22-dehydrocholesterol is shown to be independent of the intestinal population of the intestine. The possible significance of small amounts of sterols synthesized in aspic as well as narcotic treated is discussed.


All the strains of *Periplaneta americana* reared on a synthetic diet containing 0.1% cholesterol-4-C$^{14}$ (diet A) contained cholesterol, E. *Periplaneta* reared on a synthetic diet containing 0.1% cholesterol-4-C$^{14}$ and 0.016% cholesterol-4-C$^{14}$ (diet B) also contained cholesterol in all tissues. In only 2 strains of insects reared on diet B (gaster, cardiac and mid-intestine) does cholestrol account for a smaller percentage of the

Near-starved *Chenopodium* at various stages of growth were maintained for 7 months under ordinary laboratory conditions. At the end of this time the insects were extracted, the lipid content hydrolysed, and the steryl fraction acetylated and subjected to chromatography. The ionisation of Na acetate-1-C\(^{14}\) by the silverfish leads to the appearance of labelled cholesterol in the tissues of the insect. No 25-dehydrocholesterol was detected. (CA 67; 1967, 172525)


The capacity of sterols of different structural types to spare the normal dietary cholesterol requirements of D. vulpinus was studied. Correlations were made between structure and cholesterol sparing efficiency of the compounds tested, and an attempt was made to interpret the results on the basis of the assumption that these sterols are incorporated unchanged into functional spaces normally occupied by cholesterol. (In the present series of experiments the sample of **D**-cholesterol was commercial material, shown to be uncontaminated with cholesterol by a procedure in which the dienol was first mixed with **C**\(^{14}\)-labelled cholesterol and subsequently separated from it chromatographically. This material was found to be incapable of replacing cholesterol entirely, although the test had indicated that its sparing activity was complete.)

Crease, H.D., Bridges, R.G. **Phospholipids of the Housefly (Musca domestica) Stable to Hydrolysis by Med Alkali and Acid.** Biochem. J. 24 (1930) 101P.

On hydrolysis (procedure as described by Dawson in Biochem. J., 24, 248, 45) carried out on housefly extracts, 4.8% of the phospholipid phosphorus was bound after hydrolysis with alkali and mild acid. This "stable fraction" could be resolved into 2 components (method as in Biochem. J., 21 1928, 180). Hydrolysis of the "stable fraction" with 15% (v/v) HCl in methanol for 4 h at 100°C rendered a further 3.9% of the total phospholipid phosphorus water-soluble. The specific activities of the 2 fractions of this hydrolysis were different for extracts of phospholipids from flies fed on **C**\(^{14}\)-labelled orthophosphate. The possible implications of the existence of these 2 fractions are discussed.


L-[**C**\(^{14}\)]-Serine (specific radioactivity 30 μCi/mg) and carrier-free **C**\(^{14}\)-labelled orthophosphate solution in dilute HCl (radioactivity 5 μCi/ml) were available. The techniques used for labelling 1-d-old flies are described. For inter-thoracic injection, 1 μl of the orthophosphate solution (5 μCi) or the series (0.14 μCi) were administered. Subsequent extraction of phospholipids, the fractionation of phospholipids on columns of silicic acid, paper chromatography and amino reactions on paper chromatograms, location of radioactive compounds, hydrolytic procedures, chemical determinations, and measurements of specific radioactivity are described in detail. The major components of the phospholipid fraction of the housefly are phosphatidylethanolamine (60% of total lipid P), phosphatidylyceroline (15%), glyceryl ether-phosphatides (1%), and sphingolipid containing P and ethanolamides (5%). Neither phytanoylglucorl nor arginine-containing lipids could be detected positively in the lipid extract. Isotropic extraction between the P introduced and the P of the lipids was not obtained, even long after isotope introduction. Main differences between housefly and mammalian phospholipids appear to be low plasmalogon content, absence of phytanoylglycerol, occurrence of a sphingolipid containing P and ethanolamides, and the predominance of phosphatidylethanolamines.


The free sterol and sterol e chromatography. The sterol but only about 3.5% in the was used as the sole source of the fatty acids from the C\(^{18}\), C\(^{20}\), mono-unsaturated fatty acids from the triglycerides that they contained less uns.
The free sterols and sterol esters from adult female bovis domestica L. and eggs were separated by column chromatography. The sterol ester fraction accounted for about 41% of the total sterol from housefly eggs but only about 5% in the female flies. 4-C14-cholesterol with a low specific activity (1.9 x 10^6 cpm/mg) was used as the sole source of sterol and served as a marker in the chromatographic separations. Analysis of the fatty acids from the sterol ester fraction of the eggs showed that it was compounded of greater than 90% C21 and C22 mono-unsaturated fatty acids with the C20 acids accounting for about 7% of the total. The fatty acids from the triglyceride fraction of the eggs and female flies differed from the egg sterol esters in that they contained less unsaturation and a predominance of C16 fatty acids.


No significant difference between DDT-resistant and susceptible strains of 2 different American stocks was found in total lipid or phospholipid content of the larvae. Two DDT-resistant strains of an Atlantic stock, one developed by malathion selection, contained 10% to 25% more phospholipids than the susceptible strain, and the interspecific difference in the larval heads was even greater. However, towards the end of the investigation the phospholipid content of the susceptible strain increased, to equal that of the resistant strains. Breakdown of phospholipid and total lipid was equally fast in the resistant and susceptible strains, but both in DDT-contaminated and in distilled water. Isolated nerve cords of the 2 DDT-resistant Atlantic strains developed symptoms of DDT-poisoning as fast as the susceptible strain. The DDT-resistant strain developed by malathion pressure absorbed radioactive DDT one-half as fast, and retained twice as much DDT in the gut, as the susceptible strain. 4-C14-DDT ring-labelled on the para-carbons only was used. The principal fatty acid from neural lipids and phospholipids in Aedes aegypti was palmitic acid: the principal phospholipid fraction was cephalin, as in other insects. Two sets of experiments were made with larvae in which their phospholipid had been labelled with 32P (orthophosphate in nutritive medium). No qualitative differences in the lipids and phospholipids were found between resistant and susceptible strains, except in one of the American stocks. (Auth.)


The distribution and fate of 4-C14-cholesterol was studied in adult male American cockroaches (Periplaneta americana (L.)) at 1, 10, and 20 d following injection. More than 80% of the administered radioactivity was still present in the cockroaches at the end of 20 d, indicating a stable sterol economy. Exchange and transport of 4-C14-cholesterol between organs and tissues was evidenced by the continuing presence of radioactive compounds in the haemolymph and changes in the concentration of C14 compounds in several fractions. Paper chromatographic analyses of extracts indicated the presence of free sterols, sterol esters, and more polar steroids in all the tissues examined. Free sterols were predominant, accounting for 55% to 98% of the radioactive compounds present. The highest percentage of radioactive sterol ester (49%) was found in the fat body. Polar sterols were found in low concentrations except in the midgut and hindgut, where they accounted for more than one third of the total radioactivity. When the C14 sterols isolated from whole insects were analyzed by gas-liquid chromatography and reverse phase isotope dilution, greater than 97% of radioactivity was found to behave like unchanged cholesterol. (Auth.)


When 2-C14-mevalonate was injected into male and female houseflies (Musca domestica L.) at 10 & micrograms per fly, about the same amount of radioactivity was incorporated into the saponifiable and unsaponifiable lipids after 12 h. Fractionation of the unsaponifiable material by column chromatography demonstrated that less than 17% of the radioactive material behaved as hydrocarbons, and more than 49% was eluted in the sterol fraction. However, when this fraction was analyzed by digitonin precipitation, only trace amounts of radioactivity were precipitated with the sterol diglycerides, indicating that the previously reported absence of sterol synthesis from C14-acetate in the adult housefly is not due to a membranous block in the biosynthetic pathway between acetate and mevalonate. (Auth.)


Adult houseflies (Musca domestica L.) were maintained on a semi-defined diet containing 0.1% H2 hexitosterol and their eggs collected over a 20-d period. Although the major portion of the radioactive compounds
In both the adult flies and egglings, increased egg and larval sizes, as well as 30% of the HP compounds in the eggs, was found. Chromatographic analyses of the larval and adult tissues indicated the presence of two major radioactive peaks. When the largest peak, which accounted for 65% of the total HP compounds, was analyzed by gas-liquid chromatography and reverse-phase ion exchange, more than 90% of the radioactivity was found to represent β-monomethyl sterol. No conversion of β-monomethyl sterol to cholesterol was detected. The minor peak, which contained 3/7-dienes, was separately identified as 7-dehydro-β-monomethylsterol. These results indicate that the biosynthesis of monomethyl sterol directly and as a precursor to 7-dehydro-β-monomethylsterol is accompanied by detectable conversion to cholesterol. (Auth.)


It has been postulated that certain of the more primitive insects may be capable of residual cholesterol synthesis in contrast to the higher forms in which this capacity was lost through evolution. The recent report of high incorporation of dietary acetate into-C14 into cholesterol by a silverfish mastoid excretion in a primitive insect. However, several groups of Hemiptera domestica were either fed a diet containing acetate-C14 or injected with an aqueous solution of the labelled compound. Radioactivity of the total lipids indicated efficient incorporation of the acetate into lipid synthesis by both routes of administration. Gas-chromatographic analysis of the nonconjugated lipids revealed cholesterol to be the major sterol present. After administration of purified cholesterol, the sterols were isolated from the nonconjugated lipids by chromatography on alumina and diglycolan precipitation. When the steroids from all the experiments were combined and purified through the df-50m, the cholesterol had a specific activity of 3.6 cpm/pg, yielding a total incorporation of about 80 cpm. This radioactivity represents about 0.60% of that incorporated into total lipids. (CA 69: 1964, 4811c).


5a-Preg-1-cen-17α, 21-diol-3,11,20-trione-21-acetate and 5a-pregnen-17α, 11-diol-3,11,20-trione 21-acetate were used as model compounds. Tritiation was carried out by a modified Witschi technique (CA 61, 1965a) at room temperature on activated C. The tritiated substances were purified by thin-layer chromatography. The method gave good specific activity with relatively small amounts of tritiated side products. A sample of ecdysone was similarly treated, but at 198°, and very low specific activity was achieved, as was also the case with the model compounds at this temperature. (CA 69: 1964, 15969).


Adult bull weevils incorporate injected acetate-C14 into the sequestable and nonsequestable lipid fraction. The incorporation rate is approximately 0.1 in favour of the sequestable lipids during 2 hours after injection. Silic acid chromatography indicates higher synthesis rates in the cholesterol, steryl esters and phospholipids than in the neutral glycerides.


The cockroach, Periplaneta americana, was acutely fed on a diet containing minimal cholesterol-C14-3, 0.005%, and a cholesterol-sparring sterol (cholest-5-en-3β-ol-C14-3, 0.1%). Both sterols in its tissues in concentrations varying among the tissues, the cholesterol being virtually unaltered and the sparring sterol both free and esterified. Individuals from a colony of such insects were analyzed when half-grown. The concentrations of esterified and free cholesterol and sparring sterol in the different tissues were determined. The remainder of this work was allowed to grow to maturity on a diet containing the same concentrations of unlabelled sterols and were then similarly analyzed. The growth of the insects during the second half of the experiment and the concentrations and specific activities of the labelled sterols remaining were considered with the aim of assessing the extent of turnover of sterols during this period. The results indicated little if any turnover of cholesterol, but considerable turnover of sparring sterol, primarily in the unsequestered fraction. Displacement of labelled non-esterified sparring sterol into the esterified fraction took place during this period of growth. These results are consistent with the presence of at least 2 functionally distinct sterol pools in the tissues of this insect.

Kouketsu, S.I. \textit{Thermoplastic 21-stereotetane by the 946.} (In English)

Reference is made to an as of dietary 4-C14-cholesterol has been detected. However, metabolism, which behaves like chromatography and C14-cholesterol in males has been studied the metabolite. 1-cholestanyl and cholestanol are described. Cholesterol and 21-stereotetane and 1 stereotetane.


Newly emerged bees, aged heavy water, D labelled, bees and these bees of its occ on activity. Heavy water pro universal use of O in their C18-o alcohol which is to the body fluid but now C18-o hydrocarbon, with (not the compound) due to the wax glands. (CA 60: 1964, 15969).


The involvement of biotin, resorcinolated in the larvae o


Of several compounds tested, those induced by y-hexahydro acetate, malonic acid, was absent and that eugene located in maintenance of *A printing error (CA) 1* and 395.

Adult American cockroaches (Periplaneta americana) were injected with an aqueous solution of C4'-acetate and held for 24 h. On analysis, the rate of fatty acid synthesis from C4'-acetate was found to be 2.5 to 4.7 times greater in male than in female cockroaches. Analysis of the fatty acid methyl esters by gas-liquid chromatography demonstrated the relative distribution of radioactivity to be similar for both sexes, but the male and female cockroaches incorporated approximately the same percentage of radioactivity into the unsaponifiable fraction. Fractionation by column chromatography demonstrated that 98% to 95% of the radioactivity behaved as hydrocarbons and 2% to 5% as methyl esters. None of the radioactivity in the hydrocarbon fraction behaved as squalene when analysed by paper chromatography. Only low levels of radioactivity were found in the diglyceride precipitate of the sterol fraction, some of which showed distinct peaks corresponding to either the 6- or 5a'-sterol acetates following scintillation counting and chromatography on alumina. (Author)


Reference is made to an unpublished study by Loubouton et al., concerned with the utilization and metabolism of dietary 6-C4'-cholesterol by Blattella germanica (L.). No conversion of cholesterol to cholesterol had been detected. However, as much as 1% of the total C4'-cholestrol isolated from the roaches was a cholesterol metabolite, which behaved as 6'-cholesterol when either the free sterol or its acetate was analysed by gas-liquid chromatography and reverse butanol dilution. This metabolite was also found to be formed from C4'-cholesterol in roaches reared under similar conditions. An attempt was made in the present study to identify the metabolite. Large numbers of roaches were reared on a synthetic diet containing 6-C4'-cholesterol and subminral quantities of cholesterol. The extraction and subsequent analysis procedures are described. Cholesterol and 6'-cholesterol were identified. The significance of this conversion (of a acetyl to 6'-cholesterol) and the accumulation and function of the metabolite in the insect is not fully understood.


Newly emerged bees, caged with a dead queen to stimulate comb building, were given food consisting of heavy water, D-labelled ACOnA (I.), or ACOnA-1-4C (I.) for 2 weeks. The petroleum ether extracts of these bees and of their combs were fractionated chromatographically and the fractions examined for radioactivity. Heavy water produced no extreme differences in labelling of different lipid fractions indicating universal use of D in their synthesis. 1 and 2 failed to produce highly labelled wax esters (C54, H-acids and C54, H-alcohols) when synthesized occur in the combined fractions which appear able to take up moisture from the body fluid but not ACOnA. 1 and II. However, 1 and II produced highly labelled C54, H-acids and C54, H-hydrocarbons, synthesis of which takes place in the coconuts which appears able to take up acetate (or related compounds) derived from sugar degradation elsewhere. Both times transmit their lipid products to the wax glands. (CA 58: 1093, 184469)


The involvement of beetles as a coenose in biosyntheses of fatty acids from acetate-1-C4 was demonstrated in the larvae of Corcyra cephalonica. (CA 62: 1963, 213449)


Of several compounds tested, testo was found to reverse the cholestrol accumulation and growth inhibition induced by 7-cholestan-24-yn-3-one in larvae of rice moth, C. cephalonica. By using labelled acetate, malonic acid, and arginase, it was demonstrated that in this insect, cholestrol synthesis was absent and that ergostero was converted to cholesterol. The experiments suggested a key role for isolated in maintenance of optimal sterol level in the larvae times of C. cephalonica. (CA 60: 1864, 6031a)

The absorption and metabolism of $\alpha$-C$\alpha$-cholesterol by nymphal German cockroaches (Blatella germanica (L.)) was studied after two weeks on diets containing 0.65% C$\alpha$-cholesterol with and without the steroid antagonist, cholesteryl chloride, at a 1:10 ratio. Dietary cholesteryl was efficiently utilized when fed alone, with greater than 90% of the ingested steroid retained. Cholesteryl chloride caused only about a 9% to 11% decrease in cholesteryl utilization, as determined from the relative amounts of C$\alpha$-cholesterol present in the nympha and their excreta. About 99% of the C$\alpha$-cholesterol compounds from the nympha behaved chromatographically as free sterols, 5% as esters, and the remainder as more polar compounds. Analysis of the free and esterified sterols by column chromatography and reverse isotope dilution demonstrated that unchanged cholesteryl accounted for 99% of these fractions and another 2.9% behaved like 3$\alpha$-dehydro-cholesteryl. No significant amounts of either C$\alpha$-labelled bile acids or coprostanol were detected in the excreta. (Auth.)


A study was made of the metabolism of $\alpha$-sterol by nymphal German cockroaches (Blatella germanica (L.)) held for 42 days on a synthetic diet containing 0.5% of the $\alpha$-labelled sterol. Analysis of the total $\alpha$-steroids from the cockroach indicated about 8% was present as free sterol and only 2% as ester. When the $\alpha$-fraction, which accounted for about 8% of the total $\alpha$-steroids in the cockroaches, was analysed by gas chromatography and/or reverse isotope dilution, about 80% was found to be cholesterol and only about 10% behaved like unlabelled $\alpha$-sterol. These data indicate that the German cockroach has available a biochemical mechanism for the removal of the 24-ethyl group from the $\alpha$-sterol side chain. (Auth.)


Insects generally have been found to require a dietary source of sterol for normal larval growth and metamorphosis. Our work has pointed to two additional physiological roles for sterols in Musca domestica: (a) A dietary source of sterol is essential for sustained viable egg production in the female fly; on a sterol-deficient diet eggs are produced but hatchability and viability are low; (b) Cholesterol is also involved in the mobilization and utilization of nutrient reserves associated with the formation of ovarian maturation in the female fly. The quantitative sterol requirements for the above physiological processes and the metabolic conversions that occur during growth, metamorphosis and reproduction have been studied in this insect, using C$\alpha$- and $\alpha$-labelled sterols in conjunction with a variety of analytical tools, including reverse isotope dilution, gas-liquid chromatography and spectroscopy, and employing specific rearing techniques and semi-defined larval and adult diets. Both C$\alpha$-cholesterol and $\alpha$-sterol were used as a source of sterol in either the larval or the adult diet, and the pattern of utilization and metabolism was found to be almost identical for these two sterols. However, there was no detectable conversion of $\alpha$-sterol to cholesterol. Sub-minimal quantities of cholesterol have also been used in the larval diet in combination with "sparking stearic" such as cholesteryl, which will fulfill in part but not entirely the sterol requirement of this insect. The utilization and fate of the "sparking stearic" has been investigated using C$\alpha$-cholesterol, and the metabolism of the minute quantity of essential cholesterol is currently under study using high-specific-activity C$\alpha$-cholesterol. Other species of insects, including the German cockroach (Blatella germanica), have been examined in relation to the pattern of utilization and the metabolic pathways for sterols found in the housefly. (Auth.)


Experiments were carried out in order to investigate whether in Bombyx mori sterol is biosynthesized from the acetate of the same precursor as in mammals, or whether the sterol biosynthesis has an intimate relation to a stage in post-embryonic development. The C$\alpha$-acetate was therefore injected into silkworm larvae, pupae, and "Dauer" pupae. Details of the technique, the stages tested and the resulting radioactivity are given. A table summarizes the incorporation of C$\alpha$-acetate into diglyceride in the silkworm. The authors suggest that C$\alpha$-acetate is also a precursor of sterol in the silkworm, and the "Dauer" pupae.


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397 Sebela, P.D.J.W. INTERMEDIARY METABOLISM IN ASEXPTICALLY REARED BLOWFLY LARVAE. I. BIO-
Two experiments were performed with larvae of Calliphora erythrocephala. Larvae were unable to synthesize cholesterols from acetates or to synthesise us squalene in lieu of cholesterol for growth and development. Media with squalene and cholesterol supported growth and development. No C^4 from acetate was found in isolated cholesterol. Radioactivity was found in the non-extractable fraction. (CA 98: 1982, 258e)

398 Sebela, P.D.J.W. INTERMEDIARY METABOLISM IN ASEXPTICALLY REARED BLOWFLY LARVAE. II. BIO-
Nonessential amino acids and fatty acids in Calliphora erythrocephala were determined with tracer acetate-1-C^4. Fatty acids and glycerol fractions of eather-extracted, asexptically-reared larvae were used. Moderate radioactivity in isolated glycerol showed that acetic acid took part indirectly in biosynthesis. Saturated and unsaturated fatty acids were not interconvertible by hydrogenation and dehydrogenation. Degradation studies showed fatty acids were synthesized by B-oxidation from two different sources of C^4 acids. In isolated amino acids, heavy incorporation of C^4 was found in glutamic acid and aspartic acids and alanine, lesser amounts in serine, glycine, and proline. Insignificant amounts of fatty acids were found in phenylalanine, tyrosine, isoleucine, leucine, valine, histidine, arginine, and lysine. Biosynthesis in glutamic acid and aspartic and alanine showed that biosynthesis was similar to mammals. The presence of isocaproic acid in C-2 of glutamic acid indicated other pathways were also used. Tyrosine was synthesized from phenylalanine and proline from glutamic acid. Serine and glycine were closely linked. (CA 96: 1982, 2866)

See 400.

400 Strong, F.E. FATTY ACIDS: IN VIVO SYNTHESIS BY THE GREEN PEACH APHID MYXUS PECTINACE (SAL.).
After feeding through an artificial membrane, on a 10% sucrose solution containing either acetate-1-C^4 or uniformly-labelled glucose-C^4. Myxus pectinace incorporated 7% of the C^4 into palmitic acid, stearic acid, and oleic acid, small amounts were incorporated into myristic, linoleic, and linolenic acids; no significant amounts were incorporated into the short-chain fatty acids. (Amth.)

When fat body tissues from locusts was incubated for 1 h with 0.2 µM of palmitate-1-C^4 (j) in phosphate-
saline, the fatty acid was readily taken up by the tissue. (30-10%) In the tissue was recovered as glycerides. Glycerides were released into the medium from tissue prelabelled with F on labelling in haemolymph, and were then associated with lipoprotein, but this effect was seen if phosphate-saline, bone marrow, or buffered albumin solutions were used as incubation media. Release of glycerides was inhibited by F or C^4, and did not occur with heated haemolymph. The specific activity of the glycerides released was 10 times higher than the average specific activity of total tissue glyceride. (CA 89: 1983, 171e)

Fat body tissue was removed from male and female locusts (Locusta migratoria) 7-14 d after the last molt, and tissue homogenates were prepared. These homogenates could synthesize fatty acids from acetate-C^4 when supplemented with ATP, MgCl_2, glutathione, KHC03 and malonate. Addition of coenzyme A and triphosphopyridine nucleotides further stimulated synthesis. Malonate could not be re-
placed by any intermediate of the glycolytic or Krebs cycle. However, the addition of some intermediates in the presence of malonate caused further stimulation. The best results were obtained with -ketoglutarate. A particle-free supernatant (2 008 g for 30 min) appears to contain all the systems necessary for fatty acid synthesis described elsewhere for liver and mammary gland, and here obtained from fat body. C^4 labelled substrates were used to study the effects of malonate and KHC03 in the locust system. To test for a possible
connection between the decarboxylation of malonate and fatty acid synthesis in the incorporation of 1-C⁴ and of malonate-1-C⁴ into CO₂ and fatty acids by homogenate, supernatants and particles was compared.


The major steroid extracted from male Periplaneta americana kept for 20 d on a diet containing 0.1% cholestensol-C⁴ was identified as unchanged cholestensol by gas chromatography, infrared spectrum, optical rotation, and nuclear magnetic resonance spectrum. (CA 68: 1963, 9464fl)


Female Periplaneta americana L. were injected with 1-C⁴-sodium acetate, and after certain time intervals, groups of roaches were killed and the radioactivity incorporated into the lipids was measured. The turnover of several lipid fractions was studied.


Sodium acetate-3-C⁴ (3.4 μC) was injected into the body cavity of Apis mellifera L. actively synthesizing wax. C⁴ was incorporated into the free acids and esters of the wax within a few hours. The specific activity of the wax was 3900 e/mu.


It was demonstrated that the fat body of the moth P. evidens contains a system which incorporates acetate into long chain fatty acids. It requires the presence of malonate, ATP (adenosine triphosphate), coenzyme A and glycerol phosphate. The fatty acids formed by the system proved to be predominately palmitic acid and small quantities of stearic, oleic, myristic and lauric acids. (Abstract, summary)

See also:

185 Incorporation of 1⁴C into the phosphorus compounds of the wax moth larva. (Wlodaver, 1961)

197 Metabolic conversion during pupation of the Cecropia silkworm. 1. Deposition and utilization of nutrient reserves. (Bale and Wyatt, 1952)


281 Incorporation of 1⁴C-tyrosine into protein and lipid fractions of silkworms. (Shigezawa, 1970)

341 Incorporation of 1⁴C-tyrosine into protein and lipid fractions of silkworms. (Shigezawa, 1970)

351 Incorporation of 1⁴C-tyrosine into protein and lipid fractions of silkworms. (Shigezawa, 1970)

I B 7 ORGANIC ACIDS


6-3-ol larva grown on media containing radioactive phenyl-1-monogalactic acid (folic acid) were allowed to pupate 48-56 h in a culture filter paper. Radioactive areas from supernatant spots of homogenates and extracts of the crude papae were chromatographed with BuOH-HOAc-H₂O (4:1:1) on 3 mm paper. The presence of isoaxanthopterin (P) and 2-amin-4-hydroxypteridine-6-carboxylic acid was identified by their fluorescence characteristics at 355 μm excitation. Further chromatographic purification of P with ten BuOH-pyridine-H₂O (10:1:1) on 3 mm paper and quantification revealed its concentration in 200% of the radioactive material present in the sample. Due to the wide distribution of P in nature, it is postulated that it represents the end product of folic acid metabolism. This conversion requires the presence of xanthine oxidase, and it is reported that a deficiency of this enzyme accounts for the failure of D. melanogaster mutants to metabolize P; these mutants accumulate large amounts of 2-amin-4-hydroxy-pteridine of biotin from 2-amino-4- (CA 68: 1963, 19164)

Brenner-Holach, G., Lechth melanaogaster. Preliminary re

The larvae of D. melanogaster of the P-1 mutant strain were fed yeast in order to determine its specific activity after feeding rapidly transformed into CO₂ to the formation of activated


Part of the study of deuterated "acid or p-nitrobenzoic acid derivatives of arginine and glutamine by analysis of the L-arginine related compounds with the arginine derivatives were found in the


When houseflies (Muscoid domestica) emerged, the amount of P during the first day of oviposition, but after the the eggs decreased. (Abstract)

Trabone, J. E. RABIES IN Flecina, International Atomic

The infusoria of various regions envelopes the nervous system a diffusion barrier restricting underlying nervous tissue, A the uptake of C⁴-labelled m

The biochemical events in of some labelled compounds concepts of the physiological processes associated with the

Winteringham, F. W. W. "Radioisotopes and Radiation in Modern Medicine. 8, 283-301 in "Radioisotopes December 1969". (Abstract)

Ways are described in which such as paper chromatograph, count by chemicals. All of labelled compounds occur.
Synthesis the incorporation of
acetate, succinate and particles

N.E.I., Höring, E.G., THE MAJOR
A 30 day diet containing 0.3% of
lactate, infrared spectrum, optical
4444 (0).

THE AMERICAN COCKROACH,

larvae, and after certain time inserted
into the liquids was measured.

676-9,

is noladera L. actively synthesizing
in few hours. The specific

LONG CHAIN FATTY ACIDS BY
in 34, 2 (1969) 013-8,

a system which incorporates acetate
(adenine triphosphate), coenzyme
units of fatty acids were also some-
mediated by palmitic acid and

Kodoma, (An investigation of the
insectes), (Klishin and Hoffmeister,

allitromirs, (Chemical, 1960)

Kodoma, (An investigation of the
insectes), (Klishin and Hoffmeister,

SUMMARY INTO BICOCOCHETIN IN

glycine acid (folic acid) was
in mammalian parts of ammchidiated
H2 (414) on 3 mm paper. The
acetic acid (II) was identified by
chromatographic purification of I with
methanolic (esterification coupling) showed

Due to the wide distribution of I
in bacteria. This conversion
intensity of this enzyme accounts for
accumulate large amounts of

9-amin-6-glycero-epsilon-pectolase and bioprotease. A proposed metabolic pathway is presented for the synthesis of bioprotease from 9-amin-6-hydroxyproline-6-carboxylic acid in the absence of xanthine oxidase.

(CA 56: 1962, 781274)

Braun, B., Holsch, O., Lehnert, F., URE ACID FORMATION FROM GLUCOSE CARIB IN Drosophila
magnera, Preliminary report.


The larvae of D. statiosa were fed with glucose-1-C(4) or glucose-6-C(4) and the specific activity of uric acid released from larvae was determined. In the purine skeleton C atoms 2 and 3 had a higher specific activity after feeding glucose-6-C(4). In homogenate the larvae, glucose-1-C(4) is more rapidly transformed into CO2 than glucose-6-C(4) and these atoms, therefore, differ in their contribution to the formation of activated formate.

(CA 58: 1963, 9757)

Hitchcock, M., Smith, S.N., DETOXICATION MECHANISMS IN THE TICK Rhipicephalus annulatus.


Part of the study of detoxication mechanisms consisted of injectting (C(4))-benzoic acid, p-aminobenzoic acid or p-nitrobenzoic acid into ticks kept at 24°C. Extracts prepared after 24 h contained the hydrolytic derivatives of arginine and phosphoric acid. These were identified by paper chromatography and densitometry, by dilution analysis of the C(4)-labelled compounds and by conversion of the arginine derivatives into the related amino acids with arginase. When the amine-arginine derivatives were injected, glutamic acid derivatives were found in the extracts.

I-3-8 ANTIMETABOLITES

Kligos, W.W., Palmer, R.R., THE EFFECT OF 5-FlUOROURACIL ON THE VIABILITY OF HOUSE FLY EGGS.


When houseflies (Musca domestica L.) were fed a diet containing 5-fluorouracil-C(4) for 24 to 48 h after emergence, a significant quantity of the antimetabolite, or a metabolite product, was incorporated into their eggs. The amount of radioactive material incorporated into the eggs was the highest in eggs deposited during the 1st day of oviposition. The viability of the eggs was very low during the first 4 d after the start of oviposition, but after the 4th day the viability increased as the amount of detectable radioactivity in the eggs decreased.

I-3-9 CELL, TISSUE, ORGAN

Treherne, J.E., RADIOISOTOPES AND THE INSECT CENTRAL NERVOUS SYSTEM.


The influx of various radioactive compounds through the continuous cellular and fibrous membranes which envelops the nervous system has been studied. It is currently believed that the principle functions as a diffusion barrier restricting the entry of such substances as his and K ions and amino acids into the underlying nervous tissue. An attempt has been made to study this and other processes by investigating the uptake of C(4)-labelled molecules in the abdominal nerve cord of the cockroach, Periplaneta americana.

The biochemical events in insect nervous tissue were studied at the same time by following the metabolism of some labelled compounds in the nerve cord of the insect. Results are discussed in relation to current concepts of the physiology of the vertebrate nervous system. A better understanding of the permeability processes associated with the periductal membranes may help elucidate some insect toxicological problems.

Worthington, F.P.W., RADIOACTIVE TRACER TECHNIQUES IN INSECT BIOCHEMISTRY.


Ways are described in which radioactive tracer techniques combined with micro-fractionation techniques such as paper chromatography have provided powerful tool for studying the biochemical problems of insect control by chemicals. An important aspect of this type of work is the separation, assay and identification of labelled compounds recovered in trace amounts from insect tissues. Automatic radiochromatographic
techniques are available, and identification may be established by co-chromatography with authentic compounds and by studying the action of chemical reagents and specific enzymes on the labelled fraction. By labelling pools of related metabolites in vivo the effects of insecticides upon the insect may be studied. Labelled pools are formed in vivo by feeding or injecting insects with suitable labelled compounds. Comparison of the labelled pools formed when acaricides C14 and PO4-labelled PO4were injected into adult insects provided valuable data on the biochemistry of insect nerve and muscle. Pools of metabolites labelled with C14 or PO4 have served for studying the mode of action of diethyl and other insecticides in the insect. Thus, the organophosphorus insecticides appear to slow the rate of acetylcholine synthesis in vivo although they are without effect on the corresponding enzyme system. Caution is advocated in interpreting trace experiments bearing on insect resistance problems. 


A review with numerous references.


Emphasis was placed in the investigation on fluctuations in the number of circulating haemocytes during post-emergent development. Average daily haemocyte counts were made, starting within 6 h after hatching and continuing through the first 16 d of the adult. Counts were made on older adults at 5-d- and then 10-d-intervals, terminating with 100-d-old adults. That a change in haemolymph volume is not solely responsible for the observed changes in the average number of circulating haemocytes during a particular developmental stage is shown by results obtained from haemolymph volumes per cent determinations made on selected days of the 6th stadium and the adult using the C14-carbonyl labelled linum dilution technique. From an average of 49.5 haemolymph volume per cent on the 1st day of the 6th stadium there is a highly significant decrease to 27.14% on the 6th day. This is followed by a gradual rise to 46.8% per cent at the end of the stadium. At ecysis there is a non-significant decrease to 33.0% per cent on the 1st day of the adult by a slight increase, and then a gradual decrease to around 31% on the 50th day where it remains, with some fluctuations, throughout the 50th day. Differential haemocyte counts made from stained smears (Giemsa) and from fresh haemolymph indicate that differential, temporary adherence of the haemocytes to times combined with an alteration of haemolymph volume per cent may account for the repeated pattern of change in average total haemocyte counts.


See 418.


See 418.


104

H. TRITSCH ET AL.

David, R.P.; Schneidem, PAUSING SILK WORMS.

To determine whether cel radiographic techniques received injection of trit the domus of the thysan., section of the area were section of the preparations in the wounded region laid. Since thysanthes is candidate synthesis indicates that ca. insects, despite the absence.

420 Hamori, J. CHELINSITI INSECTICIDAL EFFECT. Old and new data are given plates of various insect p. corresponded with the forms varius action of the species. In the early hyperactivity the thicker arc was cut. data tabulated). Washing The toxic effect of DDT p. points. In experiments on fenitrothion, Carambora p. were not of NaCl from serum inhibition of CA.


An estimate was made, by compounds confirmed in the followed for extraction, as is thus extracted. The total method, see 1. Boli, Chem. are tabulated.

422 Haslup, J.P., Ray, J.W. CENTRAL NERVOUS SYSTE. Young adult males of Peripcut P3 labelled orthophosphate tissue was then extracted and graphy and radiometric analysis

tri-phosphate, glosamine 5 pyridine nucleotides (DPN), glucose-6 phosphate, and

Concentrations of the various

419
In order to time the spermatogonial cycle directly tritiated thymidine was injected into the abdomen of newly emerged males (0.08 mmole, with an activity of 65 μC/mill). Matting, dissecting, mounting and staining procedures followed are described. Pericon-tained 8 μ-sections were autoradiographed. It is concluded that the period from synthesis of DNA in the spermatocytes to insemination in continuously mated males is 10 d. Of this interval, 4 d are taken up by spermatocyst maturation and 5 d by spermogenesis, allowing 1 d for insemination. In males which were kept isolated until the sperm sampling the rate of maturation of spermatocytes and spermatids was the same as in continuously mated males, but labelled sperm was not detected in the ejaculate until day 11 and then contributed a much smaller fraction of the sample. A table shows the sequence of irradiated stages present in sperm samples on successive days following irradiation — provided that all sperm is inseminated as soon as it matures.


To determine whether cell multiplication may play a role in wound healing in diapausing insects, autoradiographic techniques were utilized. Disposing pupae of Hyalophora cecropia and Samia cynthia received injections of tritiated thymidine at various intervals following the infliction of a severe wound on the dorsal side of the thorax. At subsequent intervals the wounded region was excised, fixed, and 3 μ thick sections of this area were prepared, stained with hematoxylin and Eosin, and mounted with a photographic emulsion. Examination of the preparations (developed and stained after 2 weeks) revealed that numerous epidermal cells in the wounded region had incorporated the labelled thymidine. Numerous blood cells were also labelled. Since thymidine is considered a specific precursor of DNA, DNA synthesis must have occurred. Such synthesis indicates that cell duplication plays a role in the wound healing process in these diapausing insects, despite the absence of ecydysis. (From abstr.)

Hamori, J., CHOLINESTERASES IN INSECT MUSCLE INNERSATION, WITH SPECIAL REFERENCE TO THE INJECTICIDAL EFFECTS OF DDT AND DFP. (Biol. Bull. 19 (1960) 194–204.) (In English.)

Old and new data are given on cholinesterases (I) and similar esterases in the motor axon and motor end plate of various insect species. Histochemical evidence (discussed) indicates that the enzymes do not occur in the nervous system, with the few exceptions of insects, like the crickets, that have some esterases in the connective tissue. New experiments on the nerve of the various insects (including flight muscles of Apis mellifera) and different stages of DDT poisoning in the early (hyperactivity) stages of poisoning, 30–60 min after applying DDT, the I of end plates and the thicker axons were considerably reduced in terms of K<sup>+</sup> uptake of nerves and muscle tissue (quantitative data tabulated). Washing the muscles free of DDT with warm acetone completely merry esterases. The toxic effect of DDT poisoning is brought about by changes in membrane permeability and not by inhibition of enzymes. The insecticidal effect of DFP probably results from inhibition of Acetylcholinesterase. (CA 66: 1963, 57259.)


An estimate was made, by the labelled pool technique, of the relative tissue concentrations of phosphorus compounds contained in the abdominal ventral cord of adult male Periplaneta americana. The procedure followed was for extraction, analysis, and measurement. About 80% of the total P<sub>1</sub>-nerve is thus recovered. The total P<sub>1</sub> of the abdominal nerve cord was found to be 1.4 mg/g wet weight (for method, see J. Biol. Chem. 216: 1959, 469). The approximate concentrations of the various compounds tabulated.  


Young adult males of Periplaneta americana were injected intra-abdominally with 0.005 mmole of carrier-free P<sup>32</sup>-labelled orthophosphate, then maintained on a normal diet at 25–26°C for 7 d. Abdominal nervous tissue was then excised and extracted. Various fractions were studied by paper and thin-layer chromatography and radiometric assay. Adenosine-5-monophosphate, triphosphate, cystine-5-monophosphate, di- and tri-phosphates, guanylic acid, and tri-phosphates, uridine-5-triphosphate, and tri-phosphopyridine nucleotides (DPN, TPN), uridine diphosphoglucose, D-glycero-phosphate, oxine phosphate, glucose-6-phosphate, and orthophosphate were negatively identified and estimated in cockroach nerve. Concentrations of the various compounds in the abdominal cord were comparable to those found in
mammalian nervous tissue except that the cystine and methionine contents were higher. However, the apparent concentrations of some of the phosphates varied with the method of collecting and working up the nervous tissue. The amount of phospholipid in cockroach nerve was similar to that in mammalian peripheral nerve and lobar nerve.


Solutions of C14-labelled urea were applied to diapausing eggs of A. comossus and found to be absorbed into the eggs. The initial rate of intake varied with the temperature and also with the concentration of the applied solution. Eggs containing labelled urea showed a decline in radioactive activity after their removal from the urea solution. This was found to be due to the loss of C14 from the eggs in the form of CO2, thus indicating a breakdown of the urea after entering the egg. Since the release of ammonia would be expected to follow the breakdown of urea, the effect of ammonium compounds on diapausing eggs was tested. Ammonium oxalate (0.028-0.034M) was found to be effective in accelerating the rate of termination of diapause. Certain other ammonium compounds were effective in preliminary trials. (From auth.)


The contents of the scent storage sac of the green vegetable bug, Nezara viridula var. manadala (F.), consist of a mixture of 2 liquid phases which are easily separated. Gas chromatographic analysis showed 13 peaks. Nezara could be shown to be capable of incorporating acetate into the major components of the scent (including hexanal, the unknown diketone, decanal and tridecane) and does not rely on concentrating unchanged, pre-formed materials from the various parts of the plant on which it feeds in order to produce its characteristic scent.


The red fat cells of D. melanogaster were found to have a digestive basis. Two successive mutations were called lye (lyr) and ro (red cells). The mutation ro, with or without lye, caused accumulation of lye (chromatographic analysis) in larvae, pupae, and adults. A disturbance in the degradation of lye was postulated and supported by data obtained from injection of C14-lye into lye and wild type flies. Red fat cells appeared if flies developed from larvae injective lye (without ro). (CA 66: 1962, 7268m and 7355m.)


Adult D. melanogaster were fed for 2-3 days on yeast mixed with adenine-1-C14. After etherization of the flies, the ovaries were fixed in alcohol lightly stained in eosin, and quickly embedded in paraffin wax. The sections of 6 μ thickness lost their colour by hydration and were treated with ribonuclease or deoxyribonuclease in Veronal buffer. After prolonged filing in distilled water, the slides were coated with Kojak autoradiography film, exposed for 3-12 days, developed, again rinsed for several h, and stained with methyl green-pyronine or aqueous yellowish eosin. After treatment with both enzymes a slight black colour still remained in the egg cells, caused by labelled proteins or polysaccharides. Both grain count and background errors were subtracted from the count. Determination of DNA by counting the reduced Agar grains over the nuclei corroborated the results of Hartwig. DNA content doubled in each stage of the nurse nuclei up to the 9th (512 n), and slightly decreases in the 10th stage. Up to the 9th stage, DNA content, nuclear volume, and pyridine run parallel. (From N.M. Sect. 114: 1960, 3772.)


Review article, broken down into sections dealing with the nature of the fat body, carbohydrates and their metabolism, tissue respiration, lipids and the fat body, protein and amino acid metabolism, purines and pyrimidines, and pigments in the fat body. The two well defined functions of the fat body, storage and intermediary metabolism, are considered. Thus, the composition of insect blood can vary between much wider limits than are permissible in mammals, homeostatic regulation being effected by such variations as the fat body, the level of blood glucose is relatively constant; a big rise after absorption through the gut of digested carbohydrate is proven body. A sharp fall in the blood is prevented by an almost as is insulin studies are cited thereon.

Olson, W.P., O'Brien, R.D. SOLUTES INTO COCKROACH. In determinations of the in vitro (labelled with 14C or 32P and d) the Waxy layer, it was found that d increased with the polarity of the mechanical means or the use of when the solutes were topical. Two functional layers of the penetration was found with the identity of disappearance of the petrified in relation to previous r 1964, 8346q.)

Smith, D.S., Treherne, J.B. NERVOUS SYSTEM. p.401-8 J.E., Wigglesworth, V.B., 1964. Review articles, divided into a glial cells, the neuron, the n on 150 references are cited. S ganglions of Periplaneta americana ganglia and whole isolated disc of Na, K, Ca, Mg, and of the rapidly exchanging tracts medium. The ratio of eflux of their free diffusion constants.

Treherne, J.B. THE EXCHANGE OF PERIPALENA americana. L. 85, August 1969, Verhandingen nationale Congress for Entomology 10 pl of C14-labelled glucose graphly showed that the injectable glucose remaining in equilibrium abdominal nerve cord was close number of glucose molecules C14 originating as trehalose (carbohydrate material crosses t to of glucose, but since the t molecules must have been pass skeletal of aspartic acid, glut of the Krebs tricarboxylic acid was found to be incorporated as acid occupies a central position.

Treherne, J.B. SODIUM AND ROACH. J. exp. Biol. 38 (14) Influx of Na and K ions into the t increase in radioactivity with the hamatomys. The influx respectively. These values are 10.9 and 12.5 x 104 M/cm2/
side effects were higher. However, the side effects were lower than those of diuretics, making it a safer option for use in these patients.


In determinations of the in vivo penetration of K, HPO₄, H₂PO₄, dimethane, paraoxon, diethylid and DDT (labelled with ¹³¹⁻ or C₁⁴ and dissolved in various solvents) into the pronoun of Periplaneta americana from the wax layer. It was found that the penetration followed a first order kinetics. The rate of penetration increased with the polarity of the compounds. In certain cases, the outermost wax layer (I) was removed by mechanical means or the use of solvents, or both. The role of the I in regulating penetration was small when the solutes were topicaly applied in a small volume of a volatile organic solvent (such as acetone). Two functional layers of the wax were demonstrated. Dimethane in water penetrated the cuticle slowly. Overall penetration was faster with petroleum ether, less with acetone and with KCl. In tests with water. The presence of solutes from the wax layer was subjected to mathematical analysis and interpreted in relation to previous reports on the penetration of insecticides into the bodies of insects. (CA 95: 1964, 1934g)


Review articles, divided into sections dealing with the nervous system (the neural lamella and the perikarya), the glial cells, the neuron, the neuropile, the extracellular system, and the neurosecretory functions. Close on 160 references are cited. Radioisotopes were used to study the neural system in the terminal abdominal ganglion of Periplaneta americana (C₁⁴), and the effect of Na⁺ from deuterated, terminal abdominal ganglia and whole isolated abdominal nerve cords could be shown to occur in a 2-stage process. The use of Na⁺, K⁺, C₁⁴, C₁³ and C₁⁴ in whole isolated nerve cords indicated that the apparent concentrations of the rapidly exchanging fraction in the extracellular fluid were very different from those in the intracellular medium. The ratio of effect of C₁⁴-inulin molecules and Na⁺ ions was shown to be similar to the ratio of their free diffusion constants. (Acta Bioc.) 95, 1964, 1934g)


10 µl of C₁⁴-labelled glucose solution were injected into the haemolymph. Subsequent paper chromatography showed that the injected glucose was rapidly converted to trehalose, only very small amount of glucose reaching equilibrium with the trehalose. The rate of entry of radioactive material into the abdominal nerve cord was characterized by an initial steep rise due to the movement of a relatively small amount of glucose molecules of high specific activity. The second, slower, increase represents the entry of C₁⁴ originating as trehalose (and glucose in equilibrium with the haemolymph). It appears that 50% of the carbohydrate material crosses the perikarya as the large trehalose molecules (ca. 7 molecules of trehalose per 1 of glucose, but since the trehalose molecules are 17 times more concentrated, individual glucose molecules must be passing at 2,5 the rate of trehalose). The prompt appearance of C₁⁴ in the C₁³ of the arachnids of ³¹P in the CNS of the cockroach. More than ¾ of the administered C₁⁴ was found to be incorporated as glucuronic acid and glucuronic acid, suggesting that this very reactive amino acid occupies a central position in the metabolism of the cockroach CNS.


Influx of Na and K ions into the central nervous system of Periplaneta americana was studied by measuring the increase in radioactivity within the abdominal nerve cord following the injection of Na⁺ and K⁺ into the haemolymph. The influx of Na and K ions was approximately 200 and 313 nmoles/1 of nerve cord g⁻¹/₂, respectively. These values are approximately equivalent to an influx of ATP of nerve cord surface of 1.9 and 1.6 x 10⁻⁷ M/sec/mm² for Na and K ions, respectively. It is suggested that a dynamic steady


Review articles, divided into sections dealing with the nervous system (the neural lamella and the perikarya), the glial cells, the neuron, the neuropile, the extracellular system, and the neurosecretory functions. Close on 160 references are cited. Radioisotopes were used to study the neural system in the terminal abdominal ganglion of Periplaneta americana (C₁⁴), and the effect of Na⁺ from deuterated, terminal abdominal ganglia and whole isolated abdominal nerve cords could be shown to occur in a 2-stage process. The use of Na⁺, K⁺, C₁⁴, C₁³ and C₁⁴ in whole isolated nerve cords indicated that the apparent concentrations of the rapidly exchanging fraction in the extracellular fluid were very different from those in the intracellular medium. The ratio of effect of C₁⁴-inulin molecules and Na⁺ ions was shown to be similar to the ratio of their free diffusion constants. (Acta Bioc.) 95, 1964, 1934g)


Review articles, divided into sections dealing with the nervous system (the neural lamella and the perikarya), the glial cells, the neuron, the neuropile, the extracellular system, and the neurosecretory functions. Close on 160 references are cited. Radioisotopes were used to study the neural system in the terminal abdominal ganglion of Periplaneta americana (C₁⁴), and the effect of Na⁺ from deuterated, terminal abdominal ganglia and whole isolated abdominal nerve cords could be shown to occur in a 2-stage process. The use of Na⁺, K⁺, C₁⁴, C₁³ and C₁⁴ in whole isolated nerve cords indicated that the apparent concentrations of the rapidly exchanging fraction in the extracellular fluid were very different from those in the intracellular medium. The ratio of effect of C₁⁴-inulin molecules and Na⁺ ions was shown to be similar to the ratio of their free diffusion constants. (Acta Bioc.) 95, 1964, 1934g)
state rather than a static impermeability must exist across the sheath surrounding the central nervous system.

(Ind: 1964, 23070)


The greater part of the influx of Na⁺, measured by determining the decline in radioactive activity of isolated preparations maintained in a flowing physiological solution, was found to appear as a simple exponential function, both for the whole nerve cord and for isolated fragments. Sodium ions thus appear to be extruded from the central nervous system by a metabolically maintained secretionary mechanism which is also associated with the uptake of K⁺ ions. The rate of influx of Na from the terminal abdominal ganglion was not appreciably affected by the removal of substantial portions of the peritreme. The rate-limiting process in these experiments is therefore not the ion transfer across the cellular peritreme, but the exchanges associated with some underlying cellular components of the CNS. The relatively rapid effects of the poison (5,4-dihydroxychromen; cyanide) molecules and the K⁺-free solutions on the measured affinities from the intact abdominal nerve cord thus imply that the changes in the chemical composition of the external solution were quickly transmitted to the deeper layers of the CNS. The ionic fluxes calculated previously (see 453) are therefore an over-simplification.


The rate of loss of Na from the abdominal nerve cord was determined by following the decline in radioactive activity of Na⁺-loaded nerve cords isolated in flowing Ringer solution. There was a rapid initial exponential decline in radioactivity which eventually gave way to a second slower phase. The initial extraction of Na was appreciably reduced by the presence of KCl or 2,4-dinitrophenol. The rate of Na efflux was not reduced in K⁺-free solutions, but was decreased in the absence of external K⁺ ions. It appears that Na is extruded from the nerve cord by a metabolically maintained secretionary mechanism which is also associated with the uptake of K⁺. (CA 56: 1963, 78120)


The rate of loss of Na⁺ from the terminal abdominal ganglion was studied by measuring the decline in radioactive activity associated with an isolated preparation maintained in flowing physiological solution. The rate of Na efflux was substantially reduced in the presence of 0.2 mmol/l 2,4-dinitrophenol and in K⁺-free solution. The extraction of Na⁺ was not significantly affected by the removal of the fibrous and cellular sheath surrounding the ganglion. The rate-limiting process in the efflux of Na measured in the experiments was not, therefore, the transfer of ions across the nerve sheath, but an extrusion from tissues lying at a deeper level in the central nervous system. (From author, summary)


The exchange of Na ions was studied by following the escape of Na⁺ from isolated abdominal nerve cords, single connectives and ganglia. Particular attention was paid to the initial rapid exchanges of Na. The escape of Na ions occurred as a 1st stage process, the initial rapid phase giving way to a slower exponential phase of Na loss. The fast phase of efflux was not affected by the presence of 2,4-dinitrophenol, although this poison significantly reduced the slow phase of loss of Na ions. The initial fast phase is attributed to a rapid diffusion from an extracellular space, demonstrated by 14C-inulin, the 2nd phase is identified as the slower extrusion from the cellular components of the CNS. (From author, summary)


The rapidly exchanging Na⁺ fraction was found to account ~1/5 of the Na contained in deasphalted abdominal ganglia which had been labelled by injection of labelled loss in the haemolymph. This Na was associated with the extracellular spaces which, with the aid of 14C-inulin, were shown to contain 18.2% of the ganglion waters. The extracellular Na concentration was calculated as exceeding that in the haemolymph by a factor of 1.5 and being 2.5 times greater than that in the cellular fraction of the ganglion. Experiments using Na⁺, K⁺, Ca²⁺, Mg²⁺, and pH showed that the concentrations of the ions in the rapidly exchanging extracellular fractions of isolated abdominal nerve cords were different from those of the external medium. The Sc cells, cellular spaces, chloride ions were concluded to be in a dynamic equilibrium.

437 Tredman, J.E. DISTRIBUTION OF AN INSECT (Periplaneta americana L., Na⁺, K⁺, Ca²⁺, and Mg²⁺) TRANSFER AND DISTRIBUTION OF I SKELETAL TERMINAL ABDOEMAL APPROXIMATE TO A 2-STAGE PERMEABILITY (identified with the 200-ganglion, the extraction of Na ions in the 5,4 times greater than that concentrations of the K⁺, Ca⁺ effect of initial water loss in the extracellular fluid being more and the chloride


Some results are summarized in the following with reference to the more complex exchanges of labelled (23) a cellular, space, and the corn biphospho.


The CO₂ fixation was carried out at a rate higher than the respiratory rate in each of the following stages (a) adults at ecotrophic (10-35) (14-37) 1968. The increased

440 Wyatt, G.K., Knoop, K.B., SOLUBLE PHOSPHATES. 1. The acid-soluble phosphates exchange fractions measured in the absence of inorganic orthophosphate, o in smaller amounts were used. The presence of b basic phosphates needed to be modified phosphates little or glycerophosphate which was found. (Author)

See also: 23 Studies on the anatomy. 27 Studies of Chrysoelas 183 Biochemistry of insects.
surrounding the central nervous system.

NERVOUS SYSTEM OF AN INSECT

Decline in radioactivity of isolated abdominal segments may be approximated to a simple exponential. Sodium ions thus appear to exist in a series of compartments, but their relative radioactivity is not limited across the cellular membranes of the CNS. The relative radioactivity of the CNS as a whole is intermediate between that of the whole animal and of the CNS segments.
In vivo synthesis of phosphoglycerol by blowfly muscle. (Lewis and Fowler, 1962)

Fluorescence synthesis in Samia cynthia. (Lin and Wang, 1963)

The protein synthesis in silk glands, I. Transfer of radioactivity from prelabelled cell debris to particulate fractions in the cell-free systems of the posterior silk glands. (Atuma et al., 1961)

The protein synthesis in silk glands. II. Effects of inhibitors on transfer of radioactivity and role of lipid fraction in protein synthesis. (Atuma et al., 1961)

Protein synthesis in silk glands, III. Radioactive substances in cell debris. (Atuma et al., 1961)

Studies on the protein synthesis in silk glands, IV. Incorporation of labelled glycine into the vascular protein by posterior silk glands. (Atuma et al., 1961)

Autoradiographic observations on the silk glands of Bombyx mori. (Nakamura, 1960)

Fat body insects, Autoradiographic observations on incorporation of deuterium C-14 and carbonic acid C-14 in larval trophocytes of Musca domestica. (Bumpo-Celia, 1963)

Electron microscope and some biochemical studies on the cell fractions of silk glands. (Seiichiro and Shimura, 1961)

Biochemistry of silk fibroin, II. In vivo incorporation of glycine-C-14 into proteins of posterior silk gland fractions. (Seiichiro and Shimura, 1961)

Incorporation of M-C-14-aminolevulinic acid into protein and lipid fractions of silkworms. (Shigematsu, 1960)

Kinetics of synthesis of fibroin in the posterior division of the silk gland of the silkworm, Bombyx mori. (Shigematsu and Koyama, 1960)

Silkworm development and silk production. (Shigematsu, 1960)

Pattern of protein sulfation after Feulgen hydrolysis in the salivary gland cells of the silkworm, Bombyx mori. (Sturin and Knight, 1966)

Incorporation of labelled valine into the proteins of the Drosophila melanogaster. (Stevenson and Wyatt, 1963)

Electron microscope and some biochemical studies on the cell fractions of silk glands. (Sato and Shimura, 1961)

Transfer of radioactivity from labelled cell debris to particulate fractions in the posterior silk glands. (Tanaka, 1961)

Yellow pigments in the wings of papilionid butterflies. VII. Red pigments of the papilionid and nymphalid butterflies. (Umebachi, 1969)

Yellow pigments in the wings of papilionid butterflies. VIII. Consideration of the natural and distribution of the wing pigments of the papilionid butterflies. (Umebachi, 1969)

Radioactive assay of acetylcholinesterase. (Winteringham and Deane, 1962)

Acetylcholinesterase activity and competitive inhibition at low substrate concentrations. (Winteringham and Deane, 1962)

Synthesis, intercellular transport, and Abba von Drosophila melanogaster im Ovar der Stechfliege Musca domestica. (Synthesis, intercellular transport, and breakdown of ribonucleic acid in the ovary of the housefly, Musca domestica). (Matsui, 1962)

The synthesis of ribonucleic acid (RNA) by the ovary of the cricket. (Dandur and Sdfnso, 1961)

Ribonucleic acid (RNA) metabolism in the posterior silk gland of the silkworm, Bombyx mori, during the fifth instar. (Hosoda et al., 1963)

The acid-soluble phosphates from tissues of disintegrating and developing pupae of the Cecropia silkworm have been analyzed with a view to gathering evidence on metabolic regulation during metamorphosis. The phosphates from wing epidermis and fat body were fractionated by low exchange chromatography and measured directly and by isotope dilution. Results from wing epidermis were confirmed for oxidized hexose. Some measurements were also made of incorporation of injected P42. Immobilized phosphate in fat body is very low (0.1 - 0.6 µmole/g) and is taken up from haemolymph slowly in diapause and more rapidly in the developing adult. In leg tissue also it is lower than in the surrounding haemolymph. In both tissues, ATP:ADP ratios are high in diapause and rise little at the beginning of development, while AMP remains very low; from this, it is concluded that the limitation of biosynthetic rate in diapause is not a result of deficient catabolism of phosphate. α-Glycero-phosphates in fat body remain low during diapause and rise at the beginning of development, suggesting that diapause is not characterized by elevation of reduced coenzymes. Both tissues contain relatively high levels of uridine diphosphate sugar derivatives and UTP. In fat body, there is evidence for a phosphagen, phosphoethanolamine, phosphorylcholine, and glycero-phosphorylcholine are abundant in fat body, accumulating to high levels during prolonged diapause. (Auth.)


Contrary to the widespread belief that poly spermia is a normal characteristic of fertilization in Drosophila, evidence was obtained indicating that, as a rule, only one sperm is present per fertilized egg in two species investigated. Feulgen-stained whole mounts of freshly laid eggs were examined. In D. melanogaster, 92 eggs were found in meiotic stages; among these, 91 had a single sperm, 2 had 2 sperms, and 3 had no visible sperm. Among 127 eggs of D. virilis, 87 eggs had a single sperm, no sperm was visible in 26 eggs, and no case of poly spermia was observed. The possibility was investigated that soon after their alleged entry into the egg, the supernumerary sperms undergo some degenerative change which prevents their detection with the Feulgen technique. Drosophila melanogaster eggs, fertilized by H-thymidine labelled sperm, were collected; these eggs were stained, washed with Feulgen or azur-cosin-Giemsa, and processed for autoradiography. 49 eggs have been examined so far: the autoradiographic data also indicate that poly spermia is a rare event in D. melanogaster.


Feulgen-stained whole mounts of D. melanogaster and D. virilis matings eggs, and serially sectioned eggs of D. melanogaster stained with Feulgen or with azur-cosin-Giemsa were examined. No poly spermia
was observed among 87 fertilized eggs of *D. vitellus*; among 185 fertilized eggs of *D. melanogaster*, only 6 were found to be dispersive. An autoradiographic series in which we combined originate by putting some fertilized eggs of a single genotype and also labeled, the number of 20 eggs examined was monospermic, one was dispermic. A survey of the literature dealing with insect fertilization has led us to conclude that for a large number of insect species (1) physiological polymorphism does not occur and (2) when accessory sperm do occasionally enter the egg, pathological effects of polymorphism might need not be manifested. The reaction to polymorphism of these species should be considered as separate from Type I inhibition (found in those eggs in which polymorphism is physiological) and from Type II inhibition (found in those eggs in which polymorphism is physiological). We propose to name this reaction Type III inhibition, with the stipulation that it does not involve a new kind of inhibitory process against polymorphism, but simply combines features of the other two types of inhibition. (Auth.)


A method is described for the artificial feeding of individual aphids. The stylects are placed in the bore of a small capillary tube, and the aphid is effectively immobilized in this position by securing its legs to the outside with wax. By using purified solutions of turnip-yellow mosaic virus heavily labelled with P32 and P35, it was shown that the virus entered the gut of the non-vector insect *Pericomenes (Hyalorrhina) bracteolata* (L.) and that substantial quantities of apparently intact virus passed in the gut for periods of days. (From RAE-A/Sr: 1956, 318)


The apical drop found on the posterior end of eggs of species of *Culex* and *Culiseta*, described in the recent literature as being water, exhibit high surface activity and chemically seem to be an ester of several fatty acids. The apical drop appears to play a role in returning spent egg rafts to their normal position on the water surface. A phospholipid, i.e., phosphatidylcholine, could be detected in experiments on *C. tarsalis* allowed to feed on 3H-labeled chicken (NaP32O4) or sucrose solutions containing NaP32O4 (10 µCi/ml).

See also:

30 Food and food relationship of the egg and first instar syrph of *Drosophila imagines* with the aid of P32. (Quastel, 1950)

I-C Insect Labelling


Ecological observations on cecidomyiid the same individuals from *Drosophila melanogaster* (L.) is described consistent increases and a reduction. The flies were raised in a radiocative incubator. The process did not affect the adult flies. (Auth.)

449 Chatzis, I., Babu, R.S. PARA-MEDICAL WESMAEL. *WESMAEL.*

Experiments were carried out on the full-grown cecidomyiids, crushed liver mixed with *P32* through egg laying and extract.


Late larval and pupal mortality at different times (1960, 1969) were fed on *P32*-labelled food but whereas in adults it was on non-radioactive ones, the low mortality rate was only in adults and not per capita. The population under consideration remaining at the time of spring heavy mortality in the late stage. The radioactive test of mortality in wild pop.

451 Dobson, R.M. MARKING T2 TRAVEL ANIMALS. *T2* 329-99 Organized by the Soil Zoology Experimental Station, Horton.

The uses of marking, also in the materials for insect labelling, are drawn to possible harmful affe.


With an initial inoculum of 1000 *Fusarium culmorum* (L.), prov. 73% adult emergence with eq. source for 24-h, adult flies get labelled satisfactorily for field use.

453 Kessing, A. LABELLING METI of the Faculty of Agriculture 1 Review article. Mechanism of radioactive label introduction into plant and animal mediation in crop is determined by other factors, energy and specific.

454 Khazhlov, G.K. РАДИАТОР КЛЯВЕЙ, МЕЧЕНИХ Р, 60-4, Р. П. Экспон. *N1504*
ecological observations on ticks with a development cycle lasting several years sometimes involve recasting the same individuals in successive stages of development. A labelling method that was applied to Ixodes ricinus (L.) is described. Radioactive carbon (C⁰) was introduced intraperitoneally as a glycine constituent into ticks at several times when larvae and nymphs of I. ricinus were engorging on them. The ticks were rendered radioactive and were still so after the next molt: the cast skins were also radioactive. The process did not affect the ticks adversely.

4490 Chattojlu, N., Rajakumar, M., Subai, G., Saxena, P.N. LABELLING OF ADULTS OF BOOON BREVICOMA WESMAL WITH RADIOACTIVE PHOSPHORUS. INDIAN J. ETC. 22, 3 (1969) 256-59. Experiments were carried out to label adults of B. brevicomis with radioactive P. By rearing the parasites on the fat-grown caterpillars of Costera cephalotes, adult ticks could be obtained. Infective female ticks on cow were obtained. The activity in the adults was lost through egg-laying and excretion.

4500 Cook, L.M., Keenleyside, H.B.D. RADIOACTIVE LABELING OF LEPIDOCTERUS LARVAE: A METHOD OF ESTIMATING LATE LARVAL AND PUPAL MORTALITY IN THE WILD. NATURE, Lond. 187 (1960) 301-2. Late larval and pupal mortality was estimated in 2 different colonies of the moth Panestia dominula (L.) at different times (1953-1959), suggesting figures between 85% and 90%. In 1953 (Keenleyside), larvae were fed on P⁰-labeled wheat (Triticum spp.), giving 10 counts/min. In the larvae P⁰ was mostly internal whereas in adults it was concentrated in the wings. Labelling insects were clearly distinguishable from non-radioactive ones, the lowest count being 80 cpm above background, and marked larvae could be recognized easily. Adults were captured as they emerged, scanned, and treated with cellulose paint (one mark per capture) and released. The adults were found to lay about 500 eggs (approximately 1500/individual). The population under consideration comprised 4000-8000 individuals in 1962 so that the number of larvae remaining at the time of sampling was only 1/4 of the total number of eggs produced. There is thus heavy mortality in the late stages of development, after an appreciable drop in numbers has already taken place. The radioisotope technique used permits estimates which are sufficiently accurate for a thorough study of mortality in wild populations.


4520 Fay, N.W., Baer, J.T., Kilpatrick, J.W. EARING AND ISOTOPIC LABELLING OF PANSTIA CASCANILATE. J. econ. Ent. 56, 1 (1963) 67-71. With an initial stock of 5000 paper and weakly radioactive colonies of the little hostfly, Panestia cascanilat (L.), provided 500 to 15000 eggs/colony. Cultures of 10000 eggs yielded 3500 paper and 70% adult emergence with equal sex distribution. Using milk containing 3,6 mc of P⁰/1 as the only food source for 24 h, adult flies gave not counts of 678 to 1256 cpm at 8 to 10 d, and were considered to be labelled satisfactorily for field dispersion studies. (Auth.)

4530 Kass, A. LABELLING METHODS OF INSECTS WITH RADIOISOTOPES. [University of Arkansas Yearbook of the Faculty of Agriculture 1962 (1963) 11-12. (In English).] Review article, Mechanical labelling methods (extreem - sticking, dipping, painting, spraying; internal - injection, insertion) and biological labelling methods (composting of food; feeding radioactive solutions, plant and animal mediation methods; contamination of the medium) are discussed. The selection of the isotope is determined by such factors as its half-life, biological and effective half-lives, the type of emission, energy and specific activity available, and the toxicity of the label.

Khomdorov, G.D. A RADIOGRAPHICAL METHOD OF OBSERVING INSECTS AND MITES LABELED WITH
1960.

When radioactive isotopes are used in the labelling of arthropods - the radiography method is
more convenient, more reliable and less laborious than the radiometry method. Calculations are
given for determining exposure time in the preparation of clear autoradiograms with a given isotope (Ca^{45}, Fe^{59},
1^{131} or 1^{32}P). (BA 46; 1964, 31780)

455 ХУДАЕВ, Г.Д. АППАРАТ ДЛЯ МЕЧЕНИЯ ЧЕЛЮСТНОГИХ ПОРСЛЕДСТВА НАПИСЕНИЯ НИХ РАДИОАКТИВНЫХ ИЗОТОПОВ. Биол. Моск. Общ. Нектст. Прав.,

Khomdorov, G.D. AN APPARATUS FOR ARTHROPOD LABELING BY MEANS OF SPRAYING THEM WITH

A special apparatus is described, designed for simple and reliable spraying and tagging of arthropods by
means of aqueous solutions of radiotopes. No preliminary anesthetization is required: 500-300 a.
 isotopes can be labelled in 3-5 min. During the first five days following labelling there is a sharp drop in
radioactivity which then levels out. Water does not cause insects to lose their label. Plants, cockroaches
(PR), bugs, ants, and flies (Musca domestica, Musca, Hab., Culex, Musca, Musca, Musca, Musca, Musca),
have been labelled with various radiotopes. Best results were obtained with S emissions of a medium energy 280 6 MeV,


407* Мякот-Перег, Э., Сокунов, Ф.Ф., Рикман, Л.П. О ПРИМЕНЕНИИ РАДИОИЗОТОПОВ
ДЛЯ МАРКИРОВКИ МУХ. Мед. Параузит., 27, 1 (1958) 68-83.

463 Moschèl, M., Brader, L.M. MARQUEUR RADIOACTIF DES FOURMIS DANS LES PLANTATIONS
D'ANANAS. p.39-43 In "Radiobioiopes and Radiation in Entomology. Proceedings of a Symposium,

La métode de marquage radioactif convient parfaitement pour étudier certains aspects structuraux des
associations fourmi-coconuilles (Pheidole megacephala (F.) et Pseudomyrmex ferrurgens) dans les plantations
d'ananas. L'appareil original des radiobioiopes réside dans le fait qu'ils permettent, à l'aide des
métodes habituelles, de visualiser sans ambiguïté et sans perturber l'équilibre écologique et démographique,
de la densité des nids et des termitières tenu sous leur dépendance. (Aut.)

459 НОВОРЕЧЕВСКАЯ, Н.С., СОЛДАТКИНА, И.С., ЛАКСЕНКО, Л.К., МАРТЕНС, Л.А. ПРИМЕНЕ-
НИЕ РАДИОАКТИВНОГО УГЛЕРОДА ДЛЯ МЕЧЕНИЯ ЭБОК. Мед. Параузит., 32, 1

Novoroschekhova, N.S., Boldatkina, I.S., Dzhekenskaja, L.K., Martens, L.A. USE OF RADIOACTIVE

Fleas (Xenopsylla cheopis) were labelled with C^{14} by means of glycine or ascetic acid. This was done
either via the rodents' blood, with the flea feeding on it, or by direct topical application to the flea.
 Autoradiography was deemed most suitable for the detection of labelled fleas. When fleas were allowed
to feed on mice which had been given C^{14} in a dose of 600 µg/mouse, the fleas remained labelled for

5 months. Glycine production
was applied to the flea's ins

Individual, population and t
level. Some of the most ge
with Pb on Lusus hortus, re
The advantages of using Zn
extraction, and hard y-emit
Insects (Cutelbri meridacs (a nymph). The effect of env
Trimobiro adults (living at 1
slope varied greatly with re
coarsely immersed proportion;
ated Zn by egg-laying on
means. - Excursion rate to
be a better indicator of moul

461 Orainuli, M.S., Lermachi, Sceptabilis, J. econ. Ent. 9
Satisfactory levels of radioac-
adult A. Stepheons Linton by
Sufficient activity was thus
behaviour of the adults age
period of time (3-5 uniform rate with the aid of
openings were accepted.

462 Hyper-Bupa, R.L., Hapri,
LEFEE MARKERBAHN. Cstr. 29-35 u. ob. "Mepetie
1961.

463 Shura-Bura, B.L., Kluwiad,
ARBOVIRUSES LABELLED Wi
the Use of Biophysics in the
Labelling with radiotopes and
the labelled organisms i
the organisms (or parts of th
simple apparatus. By this m
this type) were shown to reta
feeding them on uninfecte

463 Sullivan, C.R. THE SURV
LABELLED WITH RADIOACT
C^{14} as cobalt isotope in a
acclimated firmly to the insect
periods (1-2 months) survi
easily detectable at distances 3
months or more lay must

464 Takahash, T.N., Denke,
MATICOSHA WITH TWEI
Semisexual Reprod., July 1 -
due to the use of radioactive tracers is discussed, amongst them in 230-4 half-life. Its relatively slow biological excretion, and hard y-emission. A variety of terrestrial and aquatic species were used, amongst them the insects Tenebrio molitor (adults and larvae) and Oncomelius fasciatus, the milkweed bug (adults and nymphs). The effect of environmental temperature on the biological half-life for Zn in newly emerged Tenebrio adults (living at 10, 20, and 30°C) was studied. Excretion was consistently exponential, but the slopes varied greatly with temperature. Biological half-life was inversely related to temperature and roughly inversely proportional to expected metabolic rate at these temperatures. The excretion of assimilated Zn by egg-laying Oncomelius is shown graphically, with large loss via the eggs and little by other means. 

Excretion rate increased greatly in 2 male Oncomelius when released out of dooms. The proved a better indicator of mortality (Tenebrio), Zn in egg laying.


Satisfactory levels of radioactivity (ca. 6000 cpm for males and 4000 cpm for females) were obtained in adult A. stephensi larvae by marking 500 4th-instar larvae in 1 litre of water with a 10 ??c of P32. Sufficient activity was obtained in the adult to permit their detection one month after release. The excretion of the adults appears to be no way be affected by the insecticide. To obtain a good adult yield in a desired period of time (3-5 days after radioactivation of the larvae), it was found necessary to select larvae of uniform size with the aid of a mechanical separator. Larvae ranging between 1.20 mm and 1.35 mm openings were accepted.


Labelling with radioactive isotope is a useful method for studying the movements of a tagged vector, and the labelled organisms can be detected by radiometry or by radiography, which is simpler, since the organisms (or parts of them) are merely exposed on an ordinary photograhic film for 24-72 h in a simple apparatus. By this method, Xerochrysea carchasi (Roths.), and Xeromphalus (Ceramphyllus) fasciatus (Rossi) were shown to retain P32 and Sr85 for 1 and 3 months, respectively. The flies were labelled by feeding them on mice which had received 4 mCi/g body weight. (From RAE-81, 1963, 219).


Co59 (as cobalt nitrate in acetone) was mixed with a de Kostinsky cement-benzene solution. The mixture was then injected firmly into the insect elytra. The tags are suitable for behavioral studies on dispersal. For short periods (1-5 months) survival is not seriously affected by tags containing 400 µCi or less, each tag is easily detectable at distances of about 1.5 feet with a portable Geiger radiation probe. For period of 3 months or more, tags must be limited to about 50 µCi of Co59; they are still readily detectable at about 5 feet.

Preliminary experiments include autoradiographic studies to establish the period(s) of isotope uptake, and whether grasshopper spermatogenesis is cyclic, as in mammals. (The electron microscope is to be used for studying possible deleterious effects of the 3H-labeled thymidine. Injections of 5 µCi (1 µCi/ml) of squamous 3H thymidine were tolerated by the grasshoppers which did not, however, survive >19 µCi. Labelling was found to occur randomly in several spermatozoan cysts of a particular follicle. Sections were exposed for >2 weeks for autoradiography.

See also:
12 Some recent studies, involving the use of radioisotopes, of the feeding behavior of two phytophagous insects. (Sachs, 1963)
13 Field studies of the daily activity and feeding behavior of Samsia pseudopallida, (Hemiptera, Scutelleridae) on wheat in North Iran. (Banki et al., 1963)
35 Sur la transmission d’isotopes radio-actifs entre deux fourmileries d’espèces différentes (formique mit, et formique polythene). (Chaumont et al., 1961)
47 A study on formation and transmission of glandular secretion of Formica (Hymenoptera, Formicidae) by means of a radiotopou technique. (Nakamura, 1960)
48 L’abésilie et la radioactivité. (Nordau, 1962)
51 Use of 3H as an aid in biological studies of the leafhopper, Scaphoideus rosaceus. (Hay and Myers, 1961)
54 Mating behaviour of Anopheles gambiae. (Oursch and Ambar, 1963)
55 The role of radioacids in insect behavior studies (Schmidt and Smith, 1963)
63 Some results of the use of tracer techniques in the study of plant protection. (Andrews et al., 1963)
66 Studies on the flight habits of some marked insects. (Eddy et al., 1963)
79 The use of radioactive phosphorus to follow the movement of the black currant gall midge. (Lloyd-Jones and Smith, 1963)
83 Population density of the underground root, Laurus flavus, as determined by tagging with 3H. (Ouim and Poulin, 1963)
87 Preliminary studies on the field movement of the olive fruit fly (Dacus oleae (Gmel.),) by labelling a natural population with radioactive phosphorus (3P). (Pelekasis et al., 1963)
88 Preliminary studies of the field movement of the olive fruit fly (Dacus oleae (Gmel.),) by labelling a natural population with radioactive phosphorus (3P). (Pelekasis et al., 1962)
89 The use of radioisotopes in the mating of Pterygaster integriceps Put. (Rakitin, 1963)
96 Étude du vagabondage de Ceratitis capitata Wied. en Tunisie à l’aide de radio-isotopes. (Souris and Chine, 1959)
98 Étude des populations et de dispersion de Ceratitis capitata Wied. (Diptे, Trypetidae) en Tunisie à l’aide des radio-isotopes. (Souris, 1963)
137 The use of radioisotopes in the study of haemipterous life cycles. (Buss and Roth, 1960)
138 Use of the radioisotopes of phosphorus for labelling granivorous Lociidae and their parasites. (Kameninov and Molchanova, 1962)
140 Application of radioactive isotopes to the study of some problems of field ecology. II. The relation between rodents and the degree to which other parasites are interchanged in a population of Phomonesia opuntia. (Dvarav, 1963)
160 Studies on the phosphorus-32 uptake in Schizocerca gregaria (Fonck.) and Anacridium aegyptium (L.). (Abdel-Malek and Abdel-Wahab, 1961)
165 Distribution of zinc-65 in the wasp, Melanothrix, and its effects on reproduction. (Grouth, 1960)
174 Excretion rate of radio-isotopes as indices of metabolic rate in nature. Biological half-life of zinc-65 in relation to temperature, food consumption, growth, and reproduction in arthropods. (Coen, 1951)
445 Surface area of apical drop of eggs of some coleopterous mollusces. (Hoff and Zwing, 1960)
477 Some biological effects produced in the body of the insect by tagging it with 3H. (Mayer and Brand, 1984)
492 Use of radioactive isotopes for the labelling of epidemiologically important arthropods. (Kudlakov, 1950)
498 Étude sur la biologie de Melanophaga, I. Emploi de l’isotope 3H pour déterminer la nature des aliments de pois de la poule. (Kalamka, 1963)

I-D Developmental a

An aqueous solution of 1-methionine injected into the haemolymph 0.06 - 10 µg each, does show development of functional motility in motpical males commenced on mating with no eggs which resulted in haemolymph contamination of the radiotrace by subsequent eggs. Some latter data from the radioactive males by unlikely, for present, that no 3H would not appear to be exploitable males more frequently, and or

Abdel-Malek, A.A. THE EFFECTS OF Culex pipiens molestus
In a study of the effect of different species of Culex pipiens molestus tarsae up to a concentration of 1% resulted in increased mortality. The period of larval and pupal occurred 2 weeks. pupation was completely inhibited of 3H in the larval medium on: On the basis of this study, it is a scale field experiments, a cone may be sufficiently radioactive

Abdel-Malek, A.A. INHIBIT FEMALES OF THE CULICUS LE NATURE, Lond. 201 (1963) 834-
Studies on the character and prevention of the virus disease of garden crops. II. Studies on the mechanism of aphid transmission of mosaic disease of Japanese radish, using radioactive phosphorus (Nishizawa, 1969)

Studies on the varietal resistance of garden crops to the virus disease. V. On the course of aphid transmission of the mosaic disease of Japanese radish determined by P and S-1 (Nishizawa et al., 1969).


Drywood termite metabolism of Viulina fungivora as shown by labelled pool technique (Metke et al., 1963).

The application of nuclear energy to agriculture (Boroughs, 1962).

The chemical connection between the biology of Xylella fastidiosa, the principal vector of phylloxera, and the insect vector of phylloxera (Turek, 1964).

Technical problems of radiotelecope measurements in insect metabolism (Klopf, 1962).

The potential for eradication of the Mediterranean fruit fly Ceratitis capitata (F.) (Haliday, 1962).

The effect of radioisotopes on the sex ratio in adults (Crandall and Pilat, 1962).


1-D Developmental and Genetic Effects Incurred through Labelling


Aqueous solutions of L-methionine labelled with C-14 which emit weak beta rays, were injected into the haemolymph of last-instar nymphs of the Japanese Cyrtius animalis (F.) at rates of 0.05 - 0.08 curies per milliliter. Nymphs at 10.0 - 0.08 curies per milliliter die before completing development, and functional normally. No eggs were laid by females, whether radioactive or normal, which mated with radioactive males although oviposition continued until the females had been removed. These results suggest that the sterility of females produced by radioactive eggs which hatched from radioactive 1st-instar nymphs contains some of the radioactive impurities. These findings provide the first indication that sterility can be induced by weak sources. As a result, the effects of these nuclei were not as severe as they are in the female of the species studied, and thus may have been less susceptible to the radioactive impurities.


In a study of the effect of different concentrations of P on the larval growth in the growth and development of Culex pipiens molestus, P was found to have little noticeable effect on the growth of the larvae up to a concentration of 5.0 μg of P/milliliter, above this concentration, larval growth was greatly retarded. The period of larval development increased at concentrations greater than 1.0 μg of P/milliliter, and population occurred 2 weeks later than in the controls. In concentrations greater than 1.0 μg/milliliter, population was completely inhibited, larvae became sluggish, stopped feeding and finally died. The effect of P at the concentration of 0.5 μg/milliliter on the emergence and radioactivity of the resulting adults was also studied. On the basis of this study, it is recommended that, for efficient utilization of radioisotopes in large-scale field experiments, a concentration of 50 μg of 1.0 μg/milliliter be employed so that emerging adult mosquitoes may be sufficiently radioactive to be readily detectable.


The radioactive solution (0.05-0.5 μg/milliliter) was injected into the haemolymph of newly emerged moths of both sexes of Prodenia by microsyringe ("Agla" brand) inserted laterally through the intersegmental...
membrane between the 6th and 7th abdominal segments. These moths were then allowed to associate with controls (same age and stock) as follows: radioactive males with normal females; radioactive females with normal males; and normal females with normal males. Oviposition occurred only after radioactive males had been removed, when sterile eggs were laid 2 to 3 hours later. Dose up to 1 μc had no deleterious effects on the moths. 1-methylthymine-3H appears to produce sterility in the male moth which has some (histological) effects on the female, so as to block oviposition altogether. The addition of radioactive males in the ratio of 1:2 to a normal population would prevent oviposition. The size production of such moths would, however, prove extremely laborious.


Populations of Ephesia, the Mediterranean flour moth, were cultured on cornmeal spiked with different concentrations of 3H. Several fitness components were measured to illustrate how insect populations react when irradiation is a chronic environmental factor. All levels of 3H employed in the experiment were detrimental to the developing organisms; those which attained adulthood reproduced another generation even though reduced in numbers. (Auth.)


See 470.


Adult virgin female wasps, Hymenoptera Hyponoea, were fed a single meal adulterated with either 0.04, 0.18, or 0.88 μc Pu3H/kggrain isotope solution. Effects on fecundity, fertility, and life span were studied. The high concentration of the ingested isotope induced sterility after the 3rd day and lethality by the 8th day. The medium concentration induced temporary sterility and late in the extrusion of the isotope's life span. The low concentration failed to induce sterility but reduced fecundity. Fertility, although reduced, persisted after the 6th day, increased to initial values toward the end of the experiment. Chromosomal damage is suggested to account for the differential radioactivity of germ cells in various stages of oogenesis. (Auth.)


Ephesia kusmatella Zeller was cultured on cornmeal spiked with 3H at concentrations of 0, 0.1, 0.3, 1.5, 8.6 and 8.8 μc/g of food. At the environmental radiation was reduced, the adults which were subjected throughout their life cycle produced progressively fewer progeny. 1.5 μc 3H/kg food approached the critical level which will inhibit population development. Life-span of the adults was not affected by the experimental conditions. Delayed development occurred at all isotope concentrations employed. The photoperiod-reaction of females at the end of their life cycle was half that of males. 24 h after solution, the radioactivity of the female moth was equal to, or greater than, that of corresponding males. Reproductive mechanism is affected in explanation. At the 2 highest culture levels (8 and 8 μc 3H/g), the increased number of males (homogametic sex) over females (heterogametic sex) is consistent with the radiation gene effect of induced recessive lethals. No selective radiation effect upon the sexual capacity of males of the F1 was indicated, since the subsequent F2 sex ratio was 1:1. (Auth.)


Larvae and adults of both sexes were used. The 3H mixture proved most deleterious when fed to adult females because it induced fecundity and sterility. Effects are traceable to 50% of a dose passing through the ovaries via egg incorporation. Although delayed development, abnormalities, and lethality can be correlated with the radioactivity of the larval food, exact quantification proved difficult. The low probability of recovering viables in the presence of dietary lethality was another complication. The life span of fed females was also used to reveal gross physiological damage. 13H and Ca3H only reduced differentiation and hatchability of the most sensitive cell types. A descending order of effectiveness of the isotopes was revealed corresponding to the half-live complicated by the end product of 3H. no evidence of any 3H was observed by the silver grain counting method. A similar study was conducted on the effects of 3H on the structure and development of the larval nervous system. The results of this study indicated that the levels of 3H used did not significantly affect the nervous system.

473 Hughes, A.M. FURTHER STUDIES OF THE EFFECTS OF 3H UPON THE NERVOUS SYSTEM OF THE LIVERFLY, Holophora lineata, in the nest of the LIVERFLY. p. 118-19 in "The Importance of Liverflies as Host of the Mycetophilidae." Methuen, rexford. (Auth.)

A statistically significant increase in the number of females in the LIVERFLY was observed when compared to the control population. The results suggest that 3H may have some effect on the behavior of the LIVERFLY, possibly influencing its ability to locate and feed on the host. The effects on the nervous system were not further studied.

474 Kaplan, W.D., Tinker, A. LIVERFLIES INDUCED BY TRITIUM. INTERNATIONAL Congress on Hymenoptera, held in Las Vegas, NV, 1965. (Auth.)

The mutagenic action of tritium on insects was demonstrated. Additional studies of induced mutations showed that tritium was not only effective in inducing mutations in insects, but also in altering the behavior of the insects. These results suggest that tritium may have a significant role in the control of insect populations.

* Fully reported in April int.


Sex-linked recessive lethals in larvae, in three experiments most heavily labeled germ cells were tested for induced lethals. The results showed that sex-linked lethals were present in the larvae. Lethals were determined in the first and second generations, with the results showing that lethals were inherited in a sex-linked manner. The effects of tritium on the genetic material of insects were further studied in these experiments.

476 Meyer, M.S., Breiden, J.R. TAGGING 3H WITH Pu3H. J.

Boll weevils (Anthonomus grandis) feeding on larval diets 3H radiolabeled were treated with 3H to induce lethals. The results showed that the effects of 3H on the genetic material of insects were further studied in these experiments.

138
RESULTS, p.21-4 in "Hafnium Biology, Hafnium Atomic Products Operation, A review commissed with different illustrates how insect populations of 416 employed in this experiment significantly increased another generation.

FERTILITY AND LIFE SPAN OF Haberbeanus, Hafnium Atomic Plant Experiment, 

FERTILITY AND LIFE SPAN OF Haberbeanus

measured together with other, 0.04, fecundity, fertility, and life span 6 mortality after the 3rd day and egg sterility (7th and 8th days), indicated some of differentiation. The low course although noticeably reduced after semen. Chromosomal damage is

in various stages of oogenesis. (Auth.)


at concentrations of 0.0, 0.1, 0.3, increased, the adults which were sub-lethality. 5.0 10^6/g food approaches 7% of the adults was not influenced by isotopic concentrations employed. The half of males, 24 h after ingestion, that of corresponding males, imago

level (5 and 5.0 10^6/g), the immatures adult is consistent with the radiation effect upon the sexual capacity of 1/t. (Auth.)

DIRECTED RADIOACTIVES IN Haber-

not detectable when fed to adult receive 66% of a dose passing through abnormalities, and lethality can be a proved difficult. The low probability complication, the life span of fed only reduced differentiation and effectiveness of the isotopes was revealed corresponding to the ascending order of their physical half-lives. Relatively brief biological half-lives complicated the comparison of alkaline earth elements with other isotopes although in all cases altered egg production had a greater influence than hatchability on the number of live offspring obtained. Sex caused temporary and permanent fecundity and sterility. Radiation intensity and the effects of some chemical features of the physiological environment are also considered. The biochemical basis of restitution is attached. Attention is paid to antinutritivity, and the effects of isotope bid on reproductive capacity.


A statistically significant increase in the number of unusual progeny from D2O-treated males over control males of D20 melanogaster was found consistently. Suggestions that part of the D2O effects may be due to the relatively high tritium content of some of the D20 stock solutions were not substantiated by experiments in which controlled amounts of tritium were added to D20. However, tritium alone caused the occurrence of a mutant in two consecutive experiments. (NSA 16 1963, 19604)


The mutagenic action of tritiated thymidine has already been reported (Experientia 16: 1964, 47). Additional studies of induced mutations have been carried out in two ways: feeding of larvae and injection of imagines. Autoradiographs of series of treated males and the normal necroscopic and spermatid count of females mated with them have shown that the lowest which observed mutation rate have been found correspond with the labelled sperm generation. Sex-linked recessive lethals induced by the treatment have been located and their distribution along the X-chromosome appears to be distinctly non-random.

* Fully reported in April issue of Genetics, 1964.


Sex-linked recessive lethals have been induced in Drosophila males by feeding tritiated thymidine to larvae. In three experiments feeding was restricted to 8 h to limit the incorporation of the isotope. The most heavily labelled germ cells appeared in the head spermatids utilized for the first of these 3-d broods tested for induced lethals, in one experiment, during which larvae were permitted to feed on labelled food throughout larval life a higher frequency of labelled sperm bundles was obtained and also heavier labelling of individual sperm. Induced mutation rates reflected the degree of incorporation, and mutations were restricted to these broods with labelled sperm. The physical characteristics of the E emissions of tritium - low energy and short mean path - led us to test the distribution of the induced mutations. The pattern is non-random and differs significantly from those obtained by the use of X-irradiation. The region of the X-chromosome from 1 to 10 is relatively free of mutations, whereas the regions between 20-35, 50-55, and 60-65 have a higher number of induced lethals than would be expected at random. Mutations have also been induced by tritiated deoxythymidine. These will be localized and the distribution compared to the one observed with H3-thymidine. If the pattern of induced mutations reflects the varying frequency of the pyrimidine bases along the length of the chromosome, the pattern induced by H3-deoxy- 

cydosine should differ from that observed with the use of H3-thymidine.


Boll weevils (Anthonomus grandis Boheman) were tagged with H3 by feeding to adults in solutions or rearing them in larval diets to which H302CO was added in varying quantities. The rates of loss of radioisotope were higher for those weevils fed H3 than for the weevils reared on the radioactive larval diet. Studies of the effects of H3 on fecundity, longevity, lengths of oviposition and pre-oviposition periods disclosed that the weevils reared from radioactive larval diet were more adversely affected than the weevils fed as adults. Females reared from the two highest dosages in the diet failed to lay eggs. 339
Larval mortality increased in proportion to the amount of radioactive in the diet, and mortality was always greater and began sooner for the weevils reared in radioactive larval diet. (Auth.)

**475**


Four groups of D. melanogaster males were injected with C¹⁴- and H²-labelled DNA precursors. In one group the males were injected as larvae; in 3 other groups and in a control group all males were injected 6 to 34 h after emergence from the pupal case. In the control group a non-labelled DNA precursor was used. Dominant lethals located as the frequency of non-hatched eggs seemed not to be induced by the amount of radioactivity used. There was, however, a significant increase in the frequency of sex-linked recessive lethals. The data suggest that sperm available for insemination 12 to 15 h after injection have the highest induced mutation rate. The frequency of induced dominant lethals was not raised above the control value by the same radioactive compounds, and there were no indication of breed differences.

* deoxycytidine acid

**478**


D. melanogaster adult males were injected with tritium-labelled or unlabelled thymidine when 1 to 54 h old. If later they were mated to a series of females, to sample sperm derived over successive 3-day periods, furnishing six cultures. The injected males in the labelled series were less vigorous and fewer than those in the control series. The 5th brood in the labelled series had a significantly higher frequency of males than any other brood in either series and had the lowest frequency of wild-type males. The frequency of mosaic females and of plesiozygous hemizygous flies was significantly higher in the labelled series than in the control series. (Auth.)

**479**


A comparative study was made of equal numbers of sex-linked lethals induced by ingested H² or X-irradiation of males of D. melanogaster. Peak production of lethals coincided with each experimental series with the period of maximum chromosome breakage. The relationship between DNA synthesis and the time of chromosome breakage was discussed. Chromosomal aberrations: deletions, translocations and inversions were recovered following treatment with either agents. The distribution of point mutation lethals induced on the X-chromosome by H² is identical to the one found after X-ray treatment. Theories which can account for the unexpected recovery of exceptional males in cultures derived from nature sperm treatment have been discussed. (Auth., summary).

See also:

19 Hessian fly feeding studies utilizing radiotrace R-22. (Gallin and Langton, 1962)
21 Feeding habits of Hessian fly larvae on H²-labelled resistant and susceptible wheat seedlings. (Gallin and Langton, 1963)
22 Determination of facts on supplementary feeding of insects with the aid of radioactive phosphorous and its effect on the mating of eggs of Memeclocyclus australis, a parasite of Hesperis Salicis L. (Kamenkova and Molotkova, 1963)
69 Marking and release experiments with a tropical mosquito by the use of radioisotopes. (Gillies, 1965)
70 Studies on the dispension and survival of Anophelles garni in East Africa, by means of marking and release experiments. (Gillies, 1963)
165 Distribution of micro-58 in the wasp, Ubrus flavipes, and its effect on reproduction. (Greas, 1962)
168 The localization, persistence and resistant genetic effects in invertebrates of ingested fourth period metals in stable and radioactive forms. (Greas, 1963)
888 Radioisotope studies of pesticide metabolism by the pineapple plant. (Gorrath, 1963)
970 Induction of chromosome aberrations in the spermatocytes of grasshoppers. (Ray-Chaudhuri, 1964)

400 Bruce-Chwatt, L.J. K. Radioisotopes in Tropical Veterinary Medicine. International A Review article. Malarias selected as examples for diseases in which the in vivo provides the main class in disease. The particular studies (dispersion range and distribution of the) to vector control (study - resistant to transmitted): the action of killing flies.


See also:

33 Experiment on the by means of radioactive isotope food of earthworms. 137 The use of radiotrace 785. The effect of isotope vector of Schistosomiasis.
I-Ε Insects as Disease Vectors for

1-Ε-1 MAN


Review article. Malaria, African trypanosomiasis, arthropod-borne viruses and bovine trypanosomiasis have been selected as examples for showing the extraordinary complexity of the epidemiology of these tropical diseases in which an insect or an arthropod acts as a vector. A knowledge of the ecology of the vector provides the main clue to the long-term planning of any methods of control or eradication of the relevant disease. The particular promise of radiotopes as tools for the following: (1) Ecological studies (dispersal range and seasonal movements; behaviour characteristics in relation to feeding, mating, oviposition and diurnal rhythmic activity; longevity studies; population density). (2) Epidemiological studies (physiology of the vector in relation to the pathogen; vectorial capacity). (3) Studies relevant to vector control (study of the normal physiology of disease vectors; study of the metabolism of vectors resistant to insecticides; study of biophysical control methods such as release of insects sterilised through the action of limiting radiations).


About 600 publications are reviewed on uses of radioactive materials in the study and control of medically important insects and their relation to human disease. The value and practicability of radiotopes as a research tool is discussed with relation to epidemiological studies on insect migration, life history, populations, and disease transmission by arthropod vectors. The use of radioactive materials in control of insects is discussed in relation to the use of radioactive materials in vector-host relationships. Suggestions and recommendations for new and additional studies with radiotopes are made for work in the field of endemic and tropical diseases.

See also:
33 Experiments on studying the feeding activity of flies parasitising Gambiae under natural conditions by means of radioisotopes. (Sokolovskii et al., 1962)
55 Use of isotopes for investigating the behaviour and ecology of insect pests in some recent studies. (Oubald, 1969)
387 The use of radiotopes in the study of haimarthish life cycles. (Dimmich, 1969)
782 The effect of ionising radiation on the biology and ecology of Blasiusis pestis, the principal vector of Schizotrypanum (i.e. Trypanosoma) cruzi in Venezuela. (Gomes et al., 1962)


I-8-2 ANIMALS


To investigate the means by which Blackflies transmit disease, P\(^{32}\) labelling was explored. Flies were allowed to feed on ducks injected with 0.26 - 0.5 mc P\(^{32}\). The radiation level in duck blood fluctuated for the first 24 hrs, then decreased until, after 1.86 hrs, the level was about 1/5 that at 14 hrs. Preliminary results indicated that ducks could be exposed to the biting activity of S. rupella at any time after isotope administration; 12 hrs were chosen for convenience. The blood volume ingested by flies at a meal was determined via the radioactivity acquired. The blood volume of 66 flies so measured averaged 1.16 (0.46 - 3.56) mm\(^3\). The rate of loss of P\(^{32}\) from the flies exceeded that from natural decay. Presumably some loss may occur in the eggs at oviposition, as in other species. Nearly double the isotope level would be required for future studies if a detectable level is to be maintained for > 30 days. S. rupella was shown to be a mobile, long-lived population, probably involving relatively few individuals. Taking into consideration the strong host and habitat preferences shown by this species, all factors would lead to a rapid and large buildup of the infective stage of parasites (e.g. Leucoctyphus) in the fly population.


Le manomètre du pou était effectué par voie d'injection intravaginale de la poule avec du P\(^{32}\). L'autoradiographie était employée pour étudier les relations hôte-parasite et l'alimentation du pou qui se nourrit principalement du sang de poule.

See also:

1570 Use of radiocarbon and radiolysis in the control of plant and animal insect pests. (Andrew et al., 1959)

I-8-3 PLANTS


The relationship between the age of rice plants at the time of inoculation and the transmission of dwarf disease by green rice leafhopper, Nephrotettix cincticeps Ulstein, was investigated by means of P\(^{32}\). After feeding for 24 hrs on diseased plants cultivated in a solution containing P\(^{32}\), the insects were transferred to healthy rice plants in the 5-8 leaf stage for a test feeding period of 24 hrs. P\(^{32}\) transfer was greatest on rice plants at the 5-8 leaf stage. Infected leafhoppers were allowed to feed on 40 species of plants. Autoradiography showed that the leafhopper transferred P\(^{32}\) to 26 species. When the insects were allowed to feed on diseased rice plant which had been labelled with P\(^{32}\) via the roots, P\(^{32}\) was found to accumulate in the Malagashian tubular.


An attempt was made to establish which plants were preferred hosts of the green peach aphid, Myzus persicae Sulzer, carrier of the Duskin mosaic virus. Aphids were allowed to feed for 95 hrs on virus diseased radish seedling which had been labelled by root absorption of P\(^{32}\). The aphids were then transferred to 20 species of plants for test feeding, the radioactivity of the plants being tested after 24 hrs of feeding (by Gehr-coupons and autoradiography). Aphids were found to transfer P\(^{32}\) particularly to the following 18 plants: Calendula arvensis, Yomogi japonicus, Spinacia oleracea, Cucumis sativus, Bellis perennis, Arabidopsis vulgaris, Ephedra sativa, Morus indica, Nicotiana tabacum, Viola tricolor var. arvensis, Pannonia spicata, Anemone nemorosa and Triosteum pinnatum. No P\(^{32}\) was transferred to Oryza sativa, Avena sativa, Digitaria sanguinalis, Plantago major and Brassica rapa.


Virus acquisition by sooty leaf-diseased young plants. When leaflace young diseased leaves, up to during a 10-day period at 80°C - to 165 plants in the 2nd part. Although increased transmission shown by uptake of C\(^{14}\)-labeled transmission peaks may indicate (Author).

488 Marakonos, K. AETHIUM

Detailed review article, see especially p. 381.

492a Nishi, T. STUDIES ON THE VIRUS DISEASE. V. ON JAPANESE RADISH DETERMINED Japanese, with English summaries.

Four species of aphids (Phoeniacus apterus) were analyzed and affected by Duskin mosaic. A root, while A. lepisioides occup. (root-labeled with P\(^{32}\)) were found to the leaves of plants even when infected plant for 24 hrs was a for 6 hrs at 10°C. It was able to seedling which had absorbed in the alimentary canal.


The studies were carried out at 10 min on virus-diseased plants 200 mc P\(^{32}\)/ml. They were the feed for 5 and 10 mins, respect. on which the aphids had been feeding. Aphids which had fed for 10 mins 9-15 healthy radish seedlings a feeding on infected material (1 and P\(^{32}\) transmission.)
487 Maramorosch, K. ACQUISITION AND TRANSMISSION OF ASTER YELLOWS VIRUS. Phytopathology 39 (1949) 1212.

Virus acquisition by aster leafhoppers (Acyrthosiphum gossypii) was found related to the site of feeding on diseased aster plants. During a 16-hour day at 20°C, only 3% of the leafhoppers acquired virus from older symptomless leaves of a diseased plant, whereas 60% acquired virus from diseased flowers and 90% from leafless stems. When leafhoppers were given free access to the entire plant or when they were caged on young diseased leaves, up to 60% acquired virus in a single day. Infective leafhoppers, transferred 32 times during a 16-hour day at 20°C to 640 stem seedlings, infected only 70 plants in the 1st part of the day, but 160 plants in the 2nd part. Transmission peaks were observed at 8 and 11 a.m. and at 3, 5, and 8 p.m. Although increased transmission during the afternoon hours coincided with increased feeding activity, as shown by uptake of C14-labelled glucose, no definite peaks were found in food uptake. The observed transmission peaks may indicate the existence of an independent mechanism governing virus transmission. (Auth.)


Detailed review article, concluded in June 1962. Some mention of work with leafhoppers is made (see especially p. 381).


After four species of aphids, Myzus persicae, Aphis mediterranea, A. gossypii, and Macrosiphum sartorial, had been feeding on radish seedlings infected by Daklen mosaic, the number of individuals which had tapped the sap of radish as well as the amount taken up by them were measured by using 32P. Experiments on the mechanism of transmission of Daklen mosaic were also carried out. The amount of sap taken up was greatly increased when the aphid had been starved for 24 hrs previously. About 86-100% of the aphids, M. persicae, and 90% of M. sartorial became infected with the mosaic virus after feeding on infected sap. M. persicae and A. mediterranea showed a high level of transmission of Daklen virus; the rate of infection was considerably lower for A. gossypii and M. sartorial.


Four species of aphids (Brevicoryne brassicae, Myzus persicae, Aphis laburnum, and Macrosiphum sartorial) were analyzed following 24-hour feeding on 32P-labelled radish (Raphanus sativus) seedlings, affected by Daklen mosaic. The first two species, considered main vectors, showed high counts in the last group, while A. laburnum occupied an intermediate position. When M. persicae was fed on infected seedling (root-labelled with 32P), then on a healthy seedling for 30 min and on another for 24 hrs, radioactivity was found in the plants even when infection could not be proved. When the aphid was allowed to feed on an infected plant for 24 hrs it was able to transmit the virus to a new host. When the aphid was fed on the leaf of radish seedling which had absorbed 32P for 24 hrs, 32P could be recognized in the stem, phloem, salivary gland, and the alimentary canal.


The studies were carried out at 15-20°C. Aphids (Myzus persicae, etc.) were allowed to feed for 5 and 10 mins on virus-diseased Japanese radish (Raphanus sativus L.) seedlings cultured in a solution containing 200 mc 32P/ml. They were then transferred successively to 10 healthy radish seedlings and allowed to feed for 5 and 10 mins, respectively. Aphids transmitted the virus up to the 6th seedlings; all 10 seedlings on which the aphids had been feeding were, however, radioactive as determined by autoradiography. Aphids which had fed for 10 mins, 1 min and 30 sec, respectively were transferred successively to 8-15 healthy radish seedlings and allowed to feed for 1 min or 30 sec in each case. With only brief feeding on infected material (1 min or 30 sec) no appreciable differences could be observed between virus and 32P transmission.
28 The feeding of normal and an race yellow-inoculated corn leafhoppers. (Oroszki and Maramorschi, 1959)

444 The fate of nonlip yellow mosaic virus in the vector aphid *Hyadaphis brassicae* (L.). (Hutchinson and Matthews, 1958)

II CHEI

II-A Gener.

492 Andreiev, S.V., Marton, B. *OF QUALITY OF SPRAYING* (1934) 133-8, (In Russian).

Application of radioactive isotopes to the study of the dynamics of pesticides and their fate in the environment.

493 Bridges, R.G. RACISOTOC 6-10, 12.

Article deals with the applicability of radioactive isotopes to the study of insecticide metabolism.


Problems and progress in the use of labelled insecticides for studying insect behavior.


Insecticides or other compounds labelled with radioisotopes are used to study their behavior and effects.

496 Kansas, C.W. THE MECH.

Reviews the mechanisms of radioisotope-labelled insecticides.

497 Flapp, P.W., Jr., Linkoual APPLIED TO ANIMALS AND AGRICULTURAL IMPORTANCE. Proc. Amer. Econ. Ent. 1960

Review article concerned with the application of radioisotopes to insect control.


Study of the behavior of insecticides using radioisotopes.


Further studies on the application of radioisotopes to insect behavior.

144
II CHEMICAL CONTROL MEASURES

II-A General Articles. Surveys, Books, Symposia


Application of radioactive isotopes makes possible the qualitative and quantitative determination of the deposit of pesticides from both ground and aerial spray. Radioisotopes with a short half-life can be used so that the method is not dangerous. Degree of irregularity in the deposit of pesticides in lateral and vertical directions and correction coefficients can be determined on the basis of which an optimum spray programme and correction norm of pesticides can be determined. (CA 89: 1983, 80655e)


Article deals with the applications of radioisotopes in insecticide research.


Problems and progress in the use of radioisotopes in insecticide research are reviewed. A list is included of labelled insecticides prepared to date: the chemical structure, label, distribution and metabolism in insects, mammals, and plants; chemical studies; plant residues; and insect resistance. The radioisotopes used in labelling insecticides include tritium, C14, P32, S35, C14N, As31, Br82, I131, and Pb212. (NSA 15: 1961, 27833.)


Insecticides or other compounds of possible importance in the mechanism of insecticidal action were labelled with radioisotopes and used in studies of the mechanisms of insecticidal action. Metabolic changes in the labelled compounds were followed in biological systems of interest and the metabolites characterized when possible. An attempt was made to relate the results to the mode of insecticidal action or other types of biological activity. Data were obtained on the persistence and toxic effects of the insecticides in plants where applicable. Results are reported from studies on organophosphorus insecticides labelled with P32, carbamate insecticides labelled with C14, aromatic acids labelled with C14, sterol metabolism in insects using cholesterol-C14 as a tracer, iodine metabolism in insects using I131 as a tracer, and tremocaine labelled with C14. A list is included of 44 publications resulting from these studies. (NSA 16: 1964, 6380)


Includes physiological and biochemical action of insecticides, sterilization, and use of attractants, as recent developments. (B.Aag. 27: 1969, 100280)


Review article concerned with the wide range of problems which have been attacked by means of radioisotopes. Labelled insecticides have been essential in obtaining some basic information on plant systems. By utilizing labelled materials it has been shown that cotton plants grown from seed treated with systemic
Insecticides absorb < 50% of the applied dose. Other studies have demonstrated that systemic insecticides are not readily translocated from treated leaves to new growth. Areas of future research are outlined.

Smith, J.N. DETOXICATION MECHANISMS. Annu. Rev. Ent. 7 (1963) 445-76.

Review article. Radiotracers were employed in some of the studies mentioned. No particular emphasis is given to them.


The article confines itself to aspects directly relevant to pesticide residue work. Separate sections deal with laboratory layout (arrangement, construction and furnaces, storage of radioisotopes, radioactive waste disposal, decontamination of equipment and personnel), selection of compounds, instrumentation (counting devices: ionization chambers, G-M counters, windrowless flow counter, gas-phase counters, immersion counters, liquid scintillation counters; ionometers and scalers; special equipment: automatic sample changers, recorders, column ionium, detectors for radioactivity on paper strips; choice of counting techniques), preparation of samples (radioactive compounds, 8°, 8°, halogen, C14°, counting of samples (background count, coincidence correction, self-absorption corrections, back-scattering, counting efficiency, decay corrections), reporting radioactive data, special techniques, and a glossary. The need is stressed for reporting the following factors for evaluating a pesticide experiment: 1. Compound (isotope and position of labelling, specific activity and how determined, radiochemical purity of compound and how determined, physical and chemical properties of compound), 2. Treatment of plant or animal (dose and how applied, treatment of plant or animal during observation period, when treated and when sacrificed, how sample was stored prior to analysis), 3. Counting (technique used to prepare samples for counting and equipment used for counting, background count and standard deviation, sample count and standard deviation, corrections applied in evaluating net count rate, if reported in ppm or μg calculations of count conversion to ppm or μg, 4. Isolation procedure.


Based on a combination of several physical properties of insecticides, a new bioassay technique has been developed. This method consists of depositing insecticide and hormone on a filter paper in a pest dish and confining insects in another dish separated from the first by another filter paper. At 5-6 hours exposure and with 10 mg of hormones in each dish, interference of 10 organophosphates, 18 cholinesters, and 3 carbamate insecticides is less than 1% of apparent DDVP. Radioactivity of C14°DDVP and gas-liquid chromatographic analysis of aldrin support the hypothesis for the mechanism of this technique. (Auth.)

* (In the present case, Drosophila melanogaster)


Studies are reported, many of them using radioisotopes (mostly 8°°, C14°, some H3°°), on a variety of topics such as insect resistance to insecticides; metabolism and toxicity of insecticides in insects; physiological aspects of lipid metabolism in insects; insect dispersal; the mechanism of hatching; etc.


Review article. The author deals with such aspects as the need for more selective insecticides; the problem of insecticide resistance; the incidence of resistant insects in the field; behavioural resistance; physiological resistance; detoxication as a mechanism of insect resistance; mechanisms of resistance not involving enzymatic detoxication; the phenomenon of cross-resistance; and the action of Insecticides. Current trends and prospects are discussed, also novel methods of chemical insect control are represented by chemosterilants. The review is documented by 102 references which also include studies in which radioisotopes have been used.

Bond, E.J. THE ACTION BY Typhula granariae EUR. An apparatus and a procedure to uptake and release of HCN; amounts of HCN had been in the body of the insect (for instance, bound HCN, of which evaporation after 26 hours, during which time the insect did not eat HCN labelled with C14°, demonstrated that this cyanide, is the demonstration of the activity of the insect). (Auth.)

Bond, E.J. THE ACTIVITY OF RESPIRE INHIBITION IN an insect of HCN at different concentrations other insects (named). S. R showed diminished pigments that HCN may act on this species with the HCN to form cyanine.

Bond, E.J. THE ACTION ON Spirobus granariae (L.).. A study of the effect of HCN showed that this poison has a
special reference to the specific step.

A new bioassay technique has been described in a recent article (1) and has been used to test a variety of compounds in insects. It involves placing a filter paper containing the compound on a petri dish and measuring the mortality rate. In our laboratory, this method was used to screen a range of pesticides for their activity against various insect species.

II-B Fumigants

II-B-a GENERAL

Page, A.B., and Lubatti, O.P. FUMIGATION OF INSECTS. AMB. REV. Ent. 8 (1952) 239-256. Review article, with incidental mention of work in which radioisotopes were utilized.

See also:
156 British Physiological Society's Annual Meeting: The Use of Isotopic Tracers in Biological Research (1952)
550 Organophosphorus insecticides and related compounds. (1963)

II-B-b CYANIDES


An apparatus and a procedure for experimental fumigation of the insects were described, with results indicating that the uptake of cyanide by the insects was influenced by factors such as temperature and humidity. The authors also noted that the effects of cyanide fumigation were more pronounced on insect species that were less tolerant of chemical exposure.


Studies were conducted to determine the impact of cyanide exposure on the development and survival of various insect species. The results indicated that cyanide fumigation had a significant effect on the growth and development of certain species, with higher concentrations causing a greater reduction in survival rates.

Bond, E.J. THE ACTION OF FUMIGANTS ON INSECTS. III. THE FATE OF CYANIDES IN FLIGHTLESS (larval) DURING FUMIGATION. J. Appl. Ent. 39 (1945) 515-520.

Experiments were performed to investigate the fate of cyanide when exposed to insects. The results showed that cyanide was rapidly absorbed by insects, with a significant portion being converted to other compounds within the insect body. The authors also noted that the absorption rate and extent varied depending on the species and the concentration of cyanide used.
carbon was found in three compounds of a tri-thiocresolic acid extract and in one compound of the hydrolyzed proteins in the body fats. Only a very small amount of the C was extracted from the insect's body as CO₂, but a considerable amount was found in the extractant; of radioactive compounds were isolated from the water soluble fraction of the extractant. One of these, a polypeptide, contained nearly half of the total labeled carbon that was extracted and most of the activity was present in the aspartic acid portion of the compound; thus it appears that this tissue cannot only synthesize amino acids but also it can synthesize and use them for the utilization of cysteine from their bodies. (Author)

508


Seedlings, 2-6 d old, of Lunum domestiertum were exposed to 98.6 % KCNO in glass containers. Radioactivity appeared in the 79% KCNO-soluble fraction and in the hydrolyzate of the inco{nble fraction within 10 min. After 3 h, 6.88% of the total activity was found in these fractions. After 10 min exposure, the activity was strong in aspartam and slight in aspartic acid and in 2 unidentified compounds. Only after 6 h did aminoshow activity, as did many amino acids, organic acids, and sugar. Parallel experiments were run with CO₂. Possible pathways of KCN assimilation are discussed. (CA 59: 1683, 90066).

509


The isotope exchange of KCN with compounds differing greatly from it in composition and structure (e.g. carbonates of alkaline and alkaline-earth metals) has been studied. The carbon-isotope exchange reaction in the KCNO-BeCNO system was investigated at 600-900°C. At high temperatures complete exchange between two compounds can be achieved. With carbonates of alkaline metals the exchange reaction occurs on melting and is completed at lower temperatures. Labeled potassium cyanide was obtained by (1) the isotope exchange reaction KCNO-BeCNO (produced in 2 h at 800°C), and (2) by separation of the mixture KCNO-BeCNO through extracting the KCN with liquid ammonia in a circulating system. By exchanging the equilibrium quantities of KCN and BeCNO, potassium cyanide is obtained with a theoretical yield of 90-97%. With UBeCNO with a high specific activity (40-70 mU/g), a KCN specific activity of 80 mu/g may be obtained. The barium carbonates depleted of C14 regenerate after the NH4CN extraction without appreciable loss.

II- B - C METHYL BROMIDE AND OTHERS

510


C-14 labeled methyl bromide was synthesized to determine the residue and distribution in brown rice, soybean and packaging materials after fumigation. The residual radioactivity in brown rice and soybean remained nearly constant after 1 month following fumigation. High radioactivity was found in bran and endosperm of brown rice but less in white rice. Methylation may thus occur in brown rice and soybean. Rice bran and endosperm are rich in proteins, oil and vitamins in complex. High residual radioactivity appears to be present in the protein fraction, less in the starch and only negligible amounts in the oil fraction of brown rice. Residual radioactivity in rice bran was distributed as follows: vitamin B complex 9%, protein fraction 42%, and residue 40%. The possible reaction of amine acids with methyl bromide to form their derivatives is discussed in the light of results from paper partition, chromatography, paper electrophoresis and absorption spectra. Methyl bromide was sometimes retained in packaging materials, in the order: polyethylene film, straw of rice, cellulose, craft paper, hemp, and mylar.
and in one compound of the hydro-
C was extracted from the insect's
9 radioactive compounds were iso-
peptides, contained nearly
activity was present in the aspartic acid
excess amino acids but also it can
See also:

725


The synthesis of sulfuryl-85 chloride, sulfuryl-35 fluoride, methane-14C, sulfuryl chloride, methane-14C, sulfuryl fluoride and methyl-14C bromide are described. Fumigation experiments were carried out on a number of different samples. Once a constant count rate was obtained after exposure under specific conditions the samples were combusted and the 14C-carbonate and 85-bromide sulfate counted. A comparison of the carbonate and sulfate count rates allowed estimation of final (ppm) residues and interpretation of previous count rates on the fumigated samples in these terms. The results and implications are discussed in some detail.

II - 8 - d METHYL ISOTHIOCYANATE

512


To 50 ml of a soil suspension, corresponding to 100 ml/l soil was added 0.1 ml 5% solution of DC-bromohydrin-85, shaken 1 h in a sealed test tube and then stored at 18°C. The tubes were opened under LN2 saturated with NH3, emptied, and rinsed with MeOH. The solution was shaken 3 min, then filtered, and the filtrate was washed with NH3-MeOH. The filtrates contained all the Me isothiocyanate of the soil samples and only approximately 8% of the SO2. The soil residue was treated with 1 ml HCl in water, filtered, and washed with the same. The SO2 of the solution was precipitated as BaSO4. The solution containing only nonvolatile compounds was evaporated to dryness, taken up with 10 ml HNO3, and added to 10 ml HClO4. The resulting soil residue was heated with Na2S2O3 and ethylene glycol. Aliquots of the basic precipitate and the MeCI solutions were counted in a scintillation counter. Counts were adjusted so that the sums of the percentages were 100%. The crude sums varied over the range 80-115%. Decomposition was rapid, as previously reported, in compost and in loam during 91 d. Steam sterilization of the soils retarded it. Degradation was slight in peat and not measurable in pure sand. (From CA 55, 1961, 33838a)

II - 8 - e NAPHTHALENE

513

Arata, K.O., Terriere, L.C. THE HYDROXYLATION OF NAPHTHALENE-2-14C BY HOUSELY MICRO-

Techniques used in isolating a microsomal fraction of housefly (Musca domestica) tissue capable of converting naphthalene to 1-naphthol and 1,2-dihydronaphthalene are described. Incubation conditions include pH, temperature, time, substrate level, micromolar levels, and cofactor requirements. The hydroxylating activity of housefly microsomes appears to vary with the growth and development of the life stages, with older adults exhibiting greater activity and larvae, the least. The cofactor reduced triphosphopyridine nucleotide seems to be more critical in the microsomal activity of mature adults. (CA 55, 1961, 9455a)

514


A non-resistant and two chlorobenzyl-hydrocarbon-resistant strains of houseflies were compared with respect to rate of metabolism of injected naphthalene-14C. Comparisons were made by 14C measurements after wet oxidation of insects at various intervals after injection. No differences in rate of metabolism or in nature of metabolites have been observed.

515

Schoenfeld, R.D., Terriere, L.C. THE METABOLISM OF NAPHTHALENE BY HOUSE FLY MICROSO- 
Microsomes prepared from homogenized tissue by osmotic shock convert naphthalene-C-14 into several hydroxylated products. These primary oxidation products are further metabolized by conjugation with tissue constituents. 5-keto- and pyruvate synthet延期 inhibit these reactions.


Mice inoculated L. (3-4 d old, of mixed sexes) and rats were fed with 1-C-14 naphthalene and 1-[1-C-14] naphthol and the products of their metabolites examined. By paper chromatography, these products were identified as glucuronides of 1-naphthol, 1.2-dihydo-1.2-dihydroxynaphthalene and 1.2-dihydronaphtho-1-hydroxynaphthalene; 1-naphthylamine: mercapturic acid conjugates of 1-naphthol and 1.2-dihydro-1.2-dihydroxynaphthalene; free 1-naphthol and 1.2-dihydronaphtho-1-hydroxynaphthalene; 2-hydroxynaphthol, 1-naphthyl sulfate may also be present. All the metabolites produced by naphthalene and 1-naphthol-treated mice were found in the urine of rats treated with naphthalene, but only 1-naphthol. Metabolites not previously detected in the urine of 1-naphthol-treated rats are 1.2-dihydronaphtho-1-hydroxynaphthalene and 1-naphtholsulfate. (Based on auth, summary)

See also: 635 The in vitro hydroxylation of naphthalene-C-14 by homogenized microsomes. (Atlan, 1983)


The mode of action of Vikane fumigant (mercury fluoride) in destroying the Western drywood termite, Kaloterinus minor Hegem, was investigated using the labelled-pool technique. 3H-labeled Vikane was used. The termites were labelled by being allowed to feed in paper towelling impregnated with sodium acetate-1-CH3O or with P-labeled phosphate. The results strongly indicate that inorganic fluoride is the primary poison, from a consideration of the disturbances in intermediary metabolism. These disturbances are deduced from variations in the paper chromatographic spots of the labelled metabolites isolated from fumigated and control termites.

II-5-8 SULPHUR DIOXIDE


In the experiments described, 16-20 year old, healthy isolated firs were used. A well-developed branch, about 10 years old, was surrounded with a polyethylene sleeve through which a phial of 500C was broken, giving an initial concentration of 9-10 mg of 50C/m3 of air. After about 30 min, the sleeve was removed and the needle tested. It was found that the needles of the treated branch had absorbed nearly the same amount of 50C, and that it is translocated to a lesser extent in unfumigated needles in other parts of the tree. The transfer of needles of shoot is very noticeable. 50C is also absorbed during the night.


An apparatus which is used to determine the activity of SO4 in a closed system. Formation of 85SO4 is described for plants with 85SO4, and preparation for gas saturation are done in the closed system, which is provided with means for flushing out radioactive gas. An electrochemical method is described for the separation of sulfate, sulfite, S-containing amino acids, and compounds in which the S is protected from oxidation by combining with amino acids. A gas chromatographic technique is described, sensitive to 50 ppm SO2. Plants were cut from the leaves of spinach plants after 7 h exposure to 50 ppm 85SO4, sectioned and fixed on microscope slides. Microautoradiography showed that S8 was 2-5 times as abundant in the gland cells of the stomata as in other cells of the epidermis. Some was found

in the vascular tissue. The 85S

in the vascular tissue. The S\(^{6}\) was quickly incorporated into cystine and glutathione as well as unidentified soluble and insoluble compounds. A considerable proportion had been oxidized to sulfate. (CA 57: 1962, 13969a).

**II-B-2-Carbon Disulfide**


See also: 1551 Apparatus for treating insects with radioactive fumigants. (Breed and Call, 1961)

**II-C Halogenated and Other Hydrocarbons**

**II-C-a General**

**II-C-b Aldrin and Dieldrin**


That the uptake of C\(^{14}\)-labelled diclinin from glass surfaces by resistant strains of *Anasa domestica* and *Anoplophora gambaee* and by a normal susceptible strain of *Aedes aegypti* was higher at 95% relative humidity than at 10%, confirmed that the insect was more available under humid than under dry conditions. The same effect was noted with diclinin-impregnated filter paper and HMC and DDT on dried soils, thus suggesting the phenomenon is general. Insects that walked over the treated surfaces actively showed less humidity effect than did those remaining stationary, or nearly so, during the experiment. (CA 66: 1966, 166766a)


The distribution of C\(^{14}\)dieldrin injected intravenously into mice (LAC grey strain) was studied. Extraction of C\(^{14}\)-dieldrin from tissues proved difficult, and experimental techniques are described in detail. Shortly after injection, high concentrations were found in the liver and brain, but the compound rapidly dispersed and, 24 h after injection, was mainly in the fatty tissues. Very little was extracted, some was probably metabolized.


A method for microsynthesising aldrin and dieldrin is described. When starting with BAC\(^{14}\)C\(_2\) (specific activity 20, 1 mCi/mg), the total yields of labelled aldrin and dieldrin are 36% and 35%, respectively. The specific activity of the end product corresponds to the activity of the BAC\(^{14}\)C\(_2\) used.

Korte, F., Kocher, W., Ludwig, G., Reckwiler, G., Schuehler, H.J., Stamm, M., Vogel, J. SYNTHETISCHE UND UNTERSUCHUNGEN VON EBENFÖRMIG C^14-MARKIERTE INSEKTIZIDE AUS DER REIHE DER HALOGENIERTE KÖHLERWASERSTOFFE UND DES EINHELDINGEN. (Syntheses and studies on some C^14-labelled insecticides belonging to the halogenated hydrocarbons and on labelled triodonerin.) Vortrag, Chemikerwochen-Tagung, Bonn, April 1962. (In German.) An abstract was published in Angew. Chem. 74 (1962) 555.

Marnforf, K., Ludwig, G., Vogel, J., Korte, F. DIE AUSSCHEIDUNG VON ALDEHN-C^14 UND DIEHLIN-C^14 SOWIHE IHRERH METABOLITEN DURCH DIE GALLE. (The excretion of C^14-labelled aldhin and diehdin as well as their metabolites via the bile.) Med. Exp. 5 (1963) 95-4. (In German, with French and English summaries.)

The experiments were carried out on male white rats to which the insecticides were administered intravenously (C^14-labelled aldhin of a specific activity of 20.7 mc/mg; 46 y; and C^14-labelled diehdin of specific activity 30.7 mc/mg; 54 y). Aldhin and diehdin together with their metabolites were excreted preferentially in the bile. Aldhin was found to be converted into diehdin and another hydrophilic met abolite in the organism. Similarly, diehdin gave rise to a hydrophilic metabolite which, on paper chromatography, was found to be identical with the hydrophilic product obtained from aldhin.


In order to study pick-up, distribution, and penetration of the insecticide and their bearing on its toxicity to the insects, films of C^14-labelled diehdin were used. Adult Tenebrion mole L. were placed on them, and insects and containers were subsequently analysed for radioactivity: 30-min and 2-hour exposures to 500 y/73.2 c/m^2 at 20°C were used. At the time the insects were removed from the film, 1/10 of the dose picked up could be shown to have penetrated, but after 1/3 or 1/2 after 2 days, ~1/10 of the total dose being lost to the container. C^14-diehdin was active enough to enable individual insects to be examined, and was subsequently replaced by C^14-diehdin for further studies.

C\(^6\)-labelled hexachlorocyclophosphatane (I) was obtained from BaC\(^{14}\)O\(_4\) (specific activity 20,2 mc/m\(\mu\)g) with a 37\% yield (specific activity after dilution: 8,46 mc/m\(\mu\)g). Four labelled insecticides were synthesized subsequently: aldin-C\(^6\) (yield 92\% relative to I), chloridrin-C\(^6\) (yield 79\% relative to II), heptachlor-C\(^6\) (yield 78\% relative to II), \(\alpha\)-chloridrin-C\(^6\) (yield 21,9\% relative to II). By-mechanical studies were carried out with \(\alpha\)-chloridrin-C\(^6\) and heptachlor-C\(^6\) on Aketo agar, the first giving a metabolite C, the second metabolites A (probably heptachlorophosphate) and E. In experiments on white rats, 50\% of the insecticides could be isolated in the organs and excreta within 48 h of intravenous or intraperitoneal injection. The insecticides were not stored in the organs, most of the activity being eliminated in the faeces. The main turnover probably takes place in the liver. Results from in vivo experiments are very different from those obtained under physiological conditions. Human research secretions and rat bile did not affect the insecticides in vivo, as body temperature. Various fungi appear to be completely insensitive to the insecticides. The \(E_I\) values for the metabolites A, B, C and D in the solutions employed agree for rats, fungi, mosquitoes larvae and liver homogenates.


Acetylene-1,2-C\(^14\) is converted successively to trichloroethylene and trichloroethylene, and this is condensed with C\(^14\)H\(_3\), in the presence of aluminium chlorides to trichloroethylene. Dechlorination gives hexachlorocyclophosphatane which undergoes a Diels-Alder addition to hexachloro-2,3,1-hepta-2,3-diene to give aldin-C\(^6\) in 12\% yield from barium carbonate. Oxidation of aldin gives the 6,7 epoxide, dielimin. The paper includes an account of the separation of hexachlorocyclophosphatane from the crude product of the Prins reaction by gas-liquid chromatography and of the separation of aldin and dielimin on a small preparative scale by reversed-phase paper chromatography. (From auth.)

II- C - c CYCLODYNE


A detailed examination of a number of derivatives of 1,2,3,4,7,8-hexachlorobicyclo[2.2.1]hept-2-ene and related compounds was undertaken to elucidate the metabolic differences in toxicity to adults of **Culex domesticus** L., that exist between closely related compounds of this type and to provide a rational basis for the development of new ones. It would appear that detoxification processes are at least partly responsible for the differences in toxicity to **Culex domesticus** between several closely related substances incorporating the hexachlorobicycloheptane nucleus, though other factors may be involved. The greater toxicity of dielimin and isodrin as compared with their precursors (aldin and isodrin) may be partly due to conversion of a carrier group (the bicycloheptane) of low efficiency to one that is more effective (the epoxybicycloheptane nucleus). The dihydro derivatives of aldin and isodrin were stabilized by seamounts, and investigations with the compounds labelled with C\(^6\) confirmed the existence of detoxification mechanism inhibited by seamounts. The epoxybicycloheptane system appears to be potentially as effective as the epoxybicycloheptane nucleus as a carrier group. Although an increase in polarity equivalent to that produced by oxidation increased the toxicity of a molecule of the type of the dihydro derivatives of aldin, the increase in toxicity was not of the expected order. However, the toxicity of this compound appears to be potentially higher than was observed as it is synergized by seamounts, and metabolized by **Culex domesticus**.

II - C - d BHC

Atalla, L.T., Lima, F.W. **DETERMINATION OF THE \(\gamma\)-ISOMER OF HEXACHLOROCYCLOHEXANE BY ISOTOPE ELUTION.** Jorn. Entomol. 43, 169 (1953, English). The isotope-elution method, associated with chromatographic separation, was applied to analysis of the \(\gamma\)-isomer of hexachlorocyclohexane. The labelled isomer is prepared by treating benzene with
gases C1 labelled with C14. Precision of the method is good, having a standard deviation of
< 0.1% for samples with -1% y-isomer. (CA 69: 1904. 12311b)

533* Elias, H., Eiser, K.H., Kobschlichter, H.W. RADIOCHEMICAL INVESTIGATION OF THE BIOMI-
XATION OF 1,3,3,4,5,6-HEXACHLOROCYCLOHEXANE. Chem., Er. 23 (1960) 23-28.
The isomerization of y-D and c.1,3,3,4,5,6-hexachlorocyclohexane (HCH) in the homo-
xenous system hexachlorocyclohexane:AICl3(CH3Cl)2 was studied quantitatively at 100-30°C as a function of time with 1-C14 and BrC14. 1-C14 (0.14 mg) and 1.8 + 0.5 mg AICl3(CH3Cl)2 was heated at various temperatures for certain periods of time, the cooled mixture shaken twice with 10-15 portions 2 HBr and evaporated, and the residue analyzed by radio-paper chromatography: the reaction time in h, and the % a, b, y, and 8-hexachlorocyclohexane in the mixture were given for the runs at the following temperatures: 99.4 + 0.1, 0.17, 7.6, 61.9, 96.2: 2.9, 5.5, 40.6, 52.9: 18.9, 9.6, 5.4, 29.9, 58.1: 26.5, 6.1, 18.6, 54.7: 114.4 + 0.1, 4, 15.9, 2.6, 37.4, 44.1: 7.8, 10.7, 5.9, 22.5, 69.9: 12, 27.4, 15.1, 60.6: 30, 9.5, 8.9, 13.5, 129.6; 0.0, 1, 10.6, 46.2, 46.2, 3.2, 18.8, 26.7, 53.0: 5, 26.4, 3.9, 11.0, 62.7, 10, 34.1, 3.2, 8.8, 50.0. A series of experiments was performed with 1-C14 and 2.5 + 0.1 mg AICl3(CH3Cl)2 at the following temperatures (reaction time in h, and % a, b, and 8-hexachlorocyclohexane in the reaction mixture given): 99.4 + 0.1, 4, 93.2, 6.8, 44, 90.5, 5.3, 1.4, 93.2, 1.0, 0.0, 93.1, 114.4 + 0.1, 9, 90.7, 6.3, 15, 85.4, 8.3, 5.3, 28, 94.0, 4.5, 1.0: 46, 94.6, 3.2, 2.1; 129.6; 0.0, 1, 92.5, 7.4, 1.9, 5, 90.5, 6.6, 3.4, 8.6, 21, 85.6, 7.0, 6.6. The evaluation of these results showed that the isomerization proceeded by equilib-
rium reactions according to the scheme: y -&gt; &gt; c = &gt; 8, in the temperature region 100-30°C, this equilib-
rium was shifted in favor of the a-isomer. Assuming molecular reactions of 2nd order, the rate
constants and activation energies of the partial steps of the isomerization were calculated. (CA 56: 1961, 2114a)

534 Pukami, J., Nakaizawa, T., Ishii, S. PENETRATION OF BHC ISOMERS THROUGH CUTICLE OF THE
AMERICAN COCKROACH. Jap. J. appl. Res. 20(1) (1961) 29-
29.
The penetration of a, b and y-isomers of BHC through the insect cuticle has been stud-
ed in order to find only the y-isomer has a high insecticidal potency. BHC-1-C14 isomers were ap-
plicated topically to Periplaneta americana, and the rate of penetration measured 1.5, 8 and 24 after treatment. The y-isomer penetrates more easily than the o and b-isomers, (or penetrating more quickly than o-BHC). The rates of penetration alone cannot, however, account for the differential toxicity observed.

535* Ishii, S., Tanaka, T., Hirono, C. SYNTHESIS OF BHC-1-C14 AND SEPARATION OF ITS ISOMERS.
MODE OF ACTION OF BHC. I. Bory-Kagome 24, 4 (1969) 131-
Radioactive BHC was synthesized from C14 labelled benzene: 0.4 moc of benzene-1-C14 (0.1 mg/1.32 mg) was diluted to 570 mg with unlabelled carrier benzene and made to react with C12 activation in CCl4 for 20 h under fluorohase light, as described. Crude BHC-1-C14 (820 mg) was obtained. Partition chromatography using silica gel and广告xene saturated with nitromethane was employed for isomer separation. After recrystallization, a-BHC-1-C14 470 mg. 8-BHC-1-C14 80 mg. y-BHC-1-C14 80 mg and 8-BHC-1-C14 80 mg were obtained. Radiocative a, b, y-BHC isomers were confirmed to be chemically pure (from autoradiograms of Mitchell's paper chromatographic technique). The wet combustion method using Van Slyke-Polish mixture could not be used for determining y-BHC-1-C14 reactively because of sublimation. The specific activity of y-BHC-1-C14 was calculated as 0.389 mc/mg from that of benzene-1-C14. The measured value was in relatively close agreement. (Proc summary)

Radioactive y-BHC emulsion, consisting of y-BHC-1-C14 (0.296 mc/mg), xylene, triton X-100, and water, was prepared to study systemic action in plan. Experiment was carried out in which the emulsion was sprayed, dropped or used for immersing roots or leaves of the rice plant. From the results it appeared that y-BHC does not easily penetrate the plant cuticle nor translocate within the plant tissues, at any rate with the specific activity used. The results thus do not agree with studies carried out elsewhere whose systemic action of y-BHC was demonstrated by bioassay.

537* Ishii, S., Mareda, A. EFFECT OF BHC. II. Bory
Chlorinated terphenyls are known to be effective in blocking photosynthesis in leaves. Subsequent radiocative activity remained on the leaf value only for the control after the treatment.

538 Kozakayu, M., Portig, J. EFFECT OF BHC ON UV EXPOSURE OF Micro-
organism and the effect on 294-r (In German).
Following the administration animals were isolated and pairs of those proved to be the whitebanded. The cuticle
formation. A single pro-treatment: Eupak and Eupark. It is partially due to acceleration.

539 Kalliova, M.N., Strojno, J. HEXANE BY THE METHOD C
A mixture of hexachlorocyclohexane (solvability at 20°C 1.8 g/100

540 Portig, J., Kozakayu, M. BHC-1-C14 ISOMER IN BEZIE
and execution of hexachlorocyclohexane of the German Plant
The metabolism and elimination of C14-labelled compounds, distri-

541 Forci, T. GIDHING EXPLORATION y-BENZENE HEXACHLORIDE
Mogakure Bay. 2, 4 (1961)
y-Benzenimalachloride-C14 located above 6 below the g
trashed by autoradiography, as well as basipetally, and w
active. Photom is solely res was discussed. (CA 59: 1961)
INVESTIGATION OF THE ISOMERIZATION OF α- and β-TERPENES

93 (1969) 2132-34.

1 00-30° as a function of time with a

2 at various temperatures and periods 0.5 10-2 and 10 min, and evaporated, to

3 at 100°, the % α- and β- terpine at

4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 34, 36, 38, 40, 42, 44, 46, 48, 50;

5 was performed with 0.14 mg DC-17

6 reaction time in h, and % α- and β-

7 = 0.1, 0.2, 0.3, 0.4, 0.5, 0.6, 0.7, 0.8, 0.9, 1.0, 1.1, 1.2, 1.3, 1.4, 1.5, 1.6, 1.7, 1.8, 1.9, 2.0, 2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 2.7, 2.8, 2.9, 3.0, 3.1, 3.2, 3.3, 3.4, 3.5, 3.6, 3.7, 3.8, 3.9, 4.0, 4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 4.7, 4.8, 4.9, 5.0;

8 isomerization proceeded by equilibri-

9 the temperature region 100-30°, this

10 reaction of 2nd order, the rate

11 were calculated. (CA 59: 1963, 9747).

COMMENTS THROUGH CUTICLE OF THE

2-7.

8 article has been studied in order to

9 isomers were applied topically

10 and 24 h after treatment. The

11 more quickly than β-isomer. The

12 to separation of its ISOMERS.

1 (Japanese, with English summary).

2 of benzene-1-C14 (0.1 mg/1 ml 12 mg)

3 with C14 isobutylated in CCl4 for

4 was obtained. Partition chromatography

5 for isomer separation.

6 and C14-labelled compounds. Following

7 isomerisation to be chemically pure

8 because of sublimation, from that of

9 (in PLANTS, MODE OF ACTION OF

10 (English summary).

11 xylene, toluene 1:100, and water,

12 from the results obtained it

13 associates within the plant tissues,

14 with trichloroacetic acid elsewhere


16 terpenyls are known to inhibit evaporation of BHC from a surface. Chlorinated terpenyl

17 (Acorus calamus) was added to $\gamma$-BHC-1-C14 emulsion to test for changes in residual action of $\gamma$-BHC. Radioactive $\gamma$-BHC emulsion with or without chlorinated terpenyl was dropped on a glass plate and a nine-plant

18 subsequent radioactivity was measured daily, and the results tabulated. No detectable residual

19 on the leaf. Addition of chlorinated terpenyl to BHC emulsion is considered of practical

20 value only for the control of domestic insects and insects in animal sheds.

21 W., Portig, I. DER STOFFWECHSEL DER HEXACHLOR-CYCLOHEXAN-ISOMEREN UND SEINE

22 DURCH MICROMOSAIK-REVIRGENDEN PHARMAKA. (The metabolism of hexachlorocy-


24 following the administration of C14- labelled BHC, the metabolites contained in the urine and stool of the

25 one of which proved to be the unchanged isomer. Organically bound chlorine occurred mostly as 2,4,6-

26 terahydroxophenol. The oxidizing microsome enzymes of the liver probably played a part in this transform-

27 single pre-treatment with α-BHC causes a marked reduction for about 5 h in the effect of

28 and/or epinephrine. It is therefore possible that the anticoagulant effect of BHC with some poison is

29 isomer due to accelerated denaturation reactions.

30 Kulkovo, M.M., Strongin, G.M., Prokhorova, M.I. DETERMINATION OF α- HEXACHLOROCYCLO-


32 a mixture of hexachlorocyclohexane isomers was extracted with enough isooctane to dissolve all 6- isomers (solubility at 30°, 1.6 g/100 g isooctane), which was then separated in 20-25% yield by partition chromatography on SiO2 gel moistened with MeOH. In an accelerated procedure, 5 g SiO2 gel, 2.8 ml MeOH, and 18 ml isooctane were charged into a column 300-500 mm long and 14 mm in diameter. The isooctane column containing the 6- isomer was added, and elution with isooctane was carried out. The 6- isomer (15-20 mg) was eluted after the α- and γ- isomers. It was recrystallised from CCl4-isooctane (yield 50%). The optimum amount of 6- isomer in the sample was 50-160 mg. As a tracer 6- isomer with an activity of 1000 impulses/min/μg was added at a ratio of 1:8 with reference to inactive 6- isomer. On artificial mixtures of α, β, γ- isomers the limit of error was 2.5%. (CA 93: 1980, 14400).

33 Portig, I., Kornah, W. RESORPTION, VERTEILUNG UND AUSSCHEIDUNG DER HEXACHLOR-


35 The metabolism and elimination of the α- and γ-isomers of BHC were investigated by means of C14- and C14-labelled compounds. Following subcutaneous and intraperitoneal application the material was rapidly distributed throughout the whole organism. High radioactivity was detected (autoradiographically) in the fatty tissue and certain well defined areas of the central nervous system. Sufficient quantitative data was obtained when measurements were interpreted in terms of the cerebral content of the organ rather than wet weight. A consistent distribution of the organic lipids was maintained even with progressive elimination. The radioactive substances contained were isolated and identified. Besides fungicidal chloroform and traces of organic chlorinated compounds only unchanged BHC was found. Elimination of radioactivity in the stool and urine commences in the first few hours following application and continues for several weeks. The 6-isomer is eliminated at twice the rate of the 6-isomer.

36 Tuti, T. GIRDLING EXPERIMENTS ON THE TRANSMOSSION OF TOPICALLY APPLIED RADIOACTIVE

37 γ-BENZENE HEXACHLORIDE-C14 IN CERTAIN WOODY PLANT WITH INSECT GALLS. Shimbe Daigaku

38 (1962) 355-78.

39 γ-Benzenhexachloride-C14 (1) was applied topically to leaf, flush terminal shoot, stem, and gall

40 located above or below the girdled portion, and its penetration and translocation in the plant tissues was

41 measured by autoradiography. Applied I was absorbed and translocated to several other tissues, especially as well basipetally, and it was especially accumulated in flush terminal shoots and galls where growth is active. Phloem is solely responsible for its translocation. The role of I in control of chestnut gall wasp was discussed. (CA 59: 1963, 18974a).
II-C-e CHLORPHENIN


The investigations described showed that chlorphenin labelled with \(^3H\) was hardly at all decomposed in the eggs or adults of Paecilomyces (Metecestizymus) cilius (Mec) (the only stage of that life tested), but was decomposed progressively in the abdomen, mid-gut and excreta of Portunus panamenus americans (L.), to which it was not toxic. The production of \(p\)-chlorobenzensulfophenolic acid increasing in the same order. The product penetrated into Citrus saplings and soybean plants and was translocated. (RAE-A 32: 1964, 45)

II-C-f DDT


The co-distillation rate of DDT with water from a plastic surface in kg of DDT/g of water concentration from 1 to at least 100 ppb (100 \(\times 10^{-9}\)) at 20°, 30°, and 30°C. At the highest concentration tested in this study, the co-distillation rate was as much as 8 times greater than that which would be anticipated on the basis of the Bunsen-Schutte equation. This finding is in line with DDT's great affinity for the air-water interface which facilitates the high co-distillation rate. The significance of these results as related to the practical use of DDT is discussed. (Essentially auth.)


A metabolite product of \(C\(^14\)-DDT in D. melanogaster Malten was found to be primarily \(2,2\)-trichloro-1,1-bis-(p-chlorophenyl) ethanone, (Keltene), confirming the findings of Kruljmo, Krulj atke for larvae. Krulj atke was found in larvae, pupae and adults exposed to larval medium containing \(C\(^14\)-DDT and also in adults exposed to topical application to \(C\(^14\)-DDT. Of the two strains of Drosophila examined by adult topical exposure, one (Oregon ec) showed the active formation of Krulj atke, while the other (Oregon ec) did not. A new, unknown metabolite of the same chromatographic mobility as \(p\)-p' dichlorobenzophenone was found in larval and pupal exposure as well as a large amount of a very polar metabolite (a). Another new metabolite of the same chromatographic mobility as \(2,2\)-dichloro-1,1-bis-(p-chlorophenyl) ethanone was found in the internal tissue extract upon adult topical exposure. (Auth.)


Of the intrinsically absorbed \(C\(^14\)-DDT administered orally or rat with thoracic lymph ducts cannulated, 67-69% was recovered in the chyle. Parabromine, 14-26% of the absorbed DDT-derived materials found in the chyle were dehydrocholoredogenated into a neutral material (DDE). (Auth., summary)

II-C-g PENTACHLORPHENOL


A method for the microsynthesis \(C\(^14\)-labelled hexachlorocyclohexane which, on chlorination, gives specific activity of 8.9 \(\mu\)g/mg of \(C\(^14\)-labeled product. However, high concentration by column chromatography, g by thin-layer and column-chromatographic techniques. A high broth metabolism A to \(P\)-octomethane (15% 23%, 40% 84%, and 50% 82% of the initial biomass was observed. The results of these experiments were consistent with activity. The \(C\(^14\)-labelled DDT was administered orally to rats with thoracic lymph ducts cannulated, 67-69% was recovered in the chyle. Parabromine, 14-26% of the absorbed DDT-derived materials found in the chyle were dehydrocholoredogenated into a neutral material (DDE). (Auth., summary)


Using highly purified \(C\(^14\)-labelled products and specific activity (20 \(\mu\)g/mg). Since the insecticide can be detected at 95°C and air humidities on evaporation began, a reactive in a temperature range, 11°C, was found after some time cause surface into the air. This mechanism
of DDT with water. J. agric. Food
1 µg of DDT/g of water concentration at the highest concentrations tested in this trial that would be anticipated on the DDT's great affinity for the air-water interface of these results as related to the naturally with.

METABOLISM OF C14-LABELLED DDT IN
used to be primarily 2,2,4-trichloro-
the of Transauto, Kelthane was found
TDT and also in adult exposed by
exposed to the adult topical exposure, one
oregon R. did not, A new, unknown
exometabolites was found in the larvae
another new metabolite of the same
chemical was found in the internal

METABOLISM OF CHLOROPHENOTHENE
rats with their thoracic lymph duct a
46% of the absorbed DDT-derived
compound (DDX). (Auth. summary)

(3,4-Cl)2Cl) - (The synthesis of penta-
chlorobenzene. In German).

Hunting insects. Synthesis is based on
lactophenol produced. It was carried
with 15.9 µg (~65%, relative to pentoxy) of a specific activity of 2 µCi/g.

II-1-1-1-2 TELORDIN


A method for the microorganisms of Telodrin (C14-labelled in the hexahydrochlophenothene stage) was developed. C14-labelled hexachloroacetophenone reaction with 3,5-dichloroacetone to give the diarte-label residue that on chloroform, gives C14-labelled Telodrin. A 59% yield, relative to the pentachloro, with a specific activity of 8.9 µCi/mg, was obtained. The microsynthesis of Telodrin-1,2,4-C14 (with a yield of 20% relative to C14-C12, and specific activity 10.4 µCi/mg) was repeated. Both products were purified by column chromatography, giving a purity > 90%. The synthesis products were checked against controls by thin-layer and column chromatography. Telodrin-1-C14 and Telodrin-1,3-C14 give the same hydrophilic metabolite A when broken down by 4 different microorganisms. Mosquito larvae breakdown metabolites A to ~ 20% of metabolite B, which is more hydrophilic and consists of at least 3 components (17% B, 23% B1, 57% B2). The hydrolysis products of B1 were identified as Lacton 1. B1 and B2 were shown to be hydrolysable and to give rise to less hydrophilic compounds. The hydrolysis products of B1 and B2 react with diazomethane to form less hydrophilic products. Stomach sections in vitro do not affect Telodrin. The distribution of Telodrin-14C in the organs and excrements of rats, following intravenous injection, was measured, and a metabolite of Telodrin was demonstrated in bile secretion. Only ~5% of the intravenously injected activity were eliminated in the course of 16 h.

II-1-1-2 THIODAN


Part of the paper is devoted to experiments with P7-labeled Thiodan, an insecticide developed by Fihn-vorreiter Hoechst A.G. Its high vapor pressure allows application in the vapour phase which avoids possible contamination by direct contact. Experimental details are given. The uptake of the poison (not to be confused with its activity) is found to increase with increasing temperature and humidity. The technical product consists of 2 isomers with different melting points and different velocities of insecticidal effect. Experiments were continued with labelled α- and β-isomers and a (technical) mixture of equal specific activity. The α-isomer, with a higher vapor pressure than the β-, is taken up much more rapidly and in the greatest quantity. The β-isomer appears to be specifically less effective. The lowest values were obtained for the mixture; it is therefore essential to repeat this work. Activity measurements carried out on dead and live insects showed that, for a limited period, the uptake of insecticide by the dead insects was greater than that of the live ones. It is assumed that the soft radiation from Sβ is primarily picked up from insecticide on the cuticle (the total activity requires wet ash measurement). The development of higher temperatures inside the insect leads to partial sublimation at the site due to metabolic processes. The temperature drops later. An insect that is still breathing may be assumed to breathe in an increased amount of insecticide, and dissolve it in the cuticular lipids. Values obtained for radioactivity may be affected by a number of factors which must be taken into account in interpreting measurements.


Using highly purified α- and β-isomers together with technical product, all labelled with S7 of the same specific activity (20 µCi/g) problems of the application and mode of action of the isomers were studied. Since the insecticide can be applied in the vapour phase, the effect of different temperatures and air humidity on sublimation, and on penetration through the cuticle were tested. As intoxication began, a reactive increase in respiration, followed by a marked elevation of the insect's body temperature, were found. It was shown with labelled insecticides that this raising of body temperature after some time causes surface removal of the sublimated insecticide substance by way of remobilization into the air. This mechanism influences the complex mechanism of penetration, intoxication and detect-
cation in connection with temperature and relative humidity of the air. The main experiments were done with the granary weevil, Calandra granaria. Further experiments are concerned with the penetration and distribution of the labelled insecticide in the insect organism. (From auth.)

See also:

207 A new DDT-metabolising enzyme in the German cockroach. (Agosto et al., 1961)
208 Lipids of DDT-resistant and susceptible larvae of Aedes aegypti. (Furt and Brown, 1955)
209 Metabolism and toxicity of the "Cyclodiene" insecticides. (Boas and Haddon, 1963)
210 Fate of aldrin and dieldrin in locusts. (Cohen and Smith, 1961)
211 Absorption and metabolism of C14-labelled DDT by susceptible and DDT-resistant pink bollworm adults. (Boos and Addisom, 1963)
212 Density-mortality relations in mosquito bioassay. (Cuthbert and Wirth, 1963)
213 The metabolic fate of DDT-C14 in Tribolium confusum. (Dismuke et al., 1965)
214 Factors involved in differential susceptibility of corn earworm larvae to DDT. (Ganti, 1961)
215 Metabolism of dichlorodiphenyltrichloroethane in the German cockroach. (Johansen et al., 1965)
216 Fate of DDT and toxaphene applied topically to susceptible and resistant boll weevils. (Lindquist et al., 1961)
217 The enzymatic in vitro degradation of DDT by susceptible and DDT-resistant body louse. (Perry et al., 1963)
218 Insecticides in metabolism. IV. Iridohymenocarpe (3-C14). (Kotte and Schüelle, 1962)
219 Biochemical study of a malathion-tolerant strain of Aedes aegypti. (Kojima and Brown, 1961)
220 Final report on an investigation into the metabolism of insecticides R 0700, patent applied for, carried out for the firm Rhuechemie AG., Oberhausen-Holten, by means of radioisotopes. (Becker et al., 1966)
221 Uptake of telepherin by the armyworm larva exposed to residues. (Cos and Bowen, 1963)
222 Metabolism of aldrin and dieldrin by the American cockroach, Periplaneta americana (L.). (Hamilton, 1961)
223 Insecticides in metabolism. III. Microsynthesis of C14-labelled Telepherin. (Kotte and Starn, 1962)
224 Use of radioisotopes in studying the absorption, distribution and elimination of certain insecticides in animals. (Pilatov et al., 1963)
225 Studies on the metabolism of aldrin-C14 in rats and rabbits. (Isolation of metabolites). (Kochut, 1963)
226 Absorption, distribution, and elimination of α- and γ- hexanehexachloride. (Krasny et al., 1965)
227 A study of the absorption of CMC-labelled DDT from water by fish. (Harden, 1963)
228 Uptake and detoxification of C14-labelled DDT in Atlantic salmon. (Panélas and Anderson, 1963)
229 Translocation of γ-BHC in rice plant cultured in aqueous solution of C14-BHC. (Jih and Hirose, 1963)
230 Factors contributing to the loss of insecticide deposits on cattle. (Roberts and Chamberlain, 1963)
231 Determination of residues of noxious principles in milk and meat by the use of radioactive indicators. (Kartashova and Kartashov, 1961)
232 In vitro stability and recovery of insecticides from milk. (Tiemann et al., 1961)
233 Insecticide residues. Procedure for cleanup of butters prior to analysis for dieldrin residues. (McKell and Savory, 1960)
234 The application and measurement of labelled residual insecticides in some physico-chemical studies. (Phillips, 1963)
235 Extraction procedures for chloro-organic insecticides. (Klein et al., 1969)
236 Investigation into the problem of insecticide sorption by soils. (Geroldt, 1961)
237 Loss of parathion and DDT to soil from aqueous dispersions and vegetable gramineous. (Weidmann et al., 1961)
238 An isotope dilution technique was used to determine the γ-BHC content in commercial mixtures. (Siesler and Junger, 1962)
239 Some applications of radioisotopes to the study of the contamination of insects by insecticide solutions. (Lewicki, 1963)
II-D Organophosphates

II-D-a GENERAL


Emphasis is given to fundamental aspects rather than to results of applied research (except when fundamental).

The book is divided into 4 parts dealing with chemistry, biochemistry, pharmacology in mammals, and pharmacology in insects. Numerous studies in which use has been made of radioisotopes are quoted in the text.

II-D-b BAYCID


Three kinds of rice plant (two varieties: Norin No.18 and Gaisenmochi) were used and sprayed with the (90% labelled) insecticide, Baycid. The hydrolysis rate of Baycid appeared to be less than that of methyl parathion or of malathion. Only 10% of chloroform-extractable metabolites remained after 8 hr. Such metabolites consisted mainly of P5-N-phosphoro and P5-sulfone, with scarcely any oxidation products in the PO-form. When Baycid was sprayed a few days before heading, the metabolites tended to accumulate in the rice grains. 29 d after application, the metabolites in the grains were concentrated in bran not in polished rice or the husk. The water-extractable metabolites in the rice grains 14 d after application were separated by ion exchange chromatography, and the existence of phosphoric acid, O.O-dimethyl phosphoric acid, O.O-dimethyl thio phosphoric acid, O-methyl O-(3-methyl-4-mercapto-phenyl) thiophosphoric acid and an unknown metabolite were found. The proportion of a monomethylenylated compound in Baycid was unexpectedly high.

II-D-c BAYER 5 4741


This main component of the systemic (anti-mite- and aphid-) insecticide known as Bayer 5 4741 was labelled with 32P. The degradation rate (examined by chloroform-water partition coefficient of radioactive material) in citrus leaves was the same for spray and topical application. In orange fruit, the residue (on 9th day post-application) in the peel was greater than in the juices. Residues and penetration are discussed for apple trees, radish, and sugar beet. After penetration of the insecticide into plant tissues, the mesocarpoller mass of the insecticide molecule was oxidized to produce sulfone as in Syntox. Phosphoric acid and dimethyl phosphoric acid were found as the hydrolysis products of the insecticide by ion exchange chromatography, and the production ratio of these metabolites was different among the test plants.

II-D-d BAYTEX


One part of the work deals with the effect of SKF 529A (benz-diethylaminoethyl diphenylphosphonate) on the metabolism of Baytex (O.O-dimethyl O-(4-methyl-2-phenylphenyl) phosphate) by the white rat and the American cockroach, Periplaneta americana, as investigated by means of 32P, column chromatography, infrared analysis, and Cholesterol assay. Baytex elimination from rats (routinely) is discussed. Metabolites formed by phosphonyl sulfon and diphenyl sulfon oxidation of Baytex by rats included the oxygen analogue, the sulfone and sulfone of the parent compound, the oxygen analogue sulfone, and the oxygen analogue sulfone.

These oxidation products were isolated by selective solvent extraction, separated and characterized. The hydrolysis products of Baytex were dimethyl phosphonobis
acid, and dimethyl phosphoric acid. Two hydrolysis products were not characterized. An increase in Baytex hydrolysis was observed in coenzymes pre-treated with SKF 525A, as compared with controls. SKF 525A did not, however, inhibit the oxidation of Baytex.

II - D - f DIMETHOATE

556


Seven new dimethoate derivatives were prepared in the laboratory, purified, and characterized. Derivatives containing dimethoxy groups were more effective against the house fly, Musca domestica L., than the dibromo compounds. As the N-carbamoyl chain length increased in number of carbon atoms, the toxicity to house flies decreased; the dimethoxy-substituted amides were more effective than the dialkyl-substituted amides. In a chain length of the dialkoxo or N-carbamoyl groups resulted in increased stability to alkaline hydrolysis. The more toxic materials to the house fly were those having the C=O bond between 5.89 and 3.95 k. The absorption, distribution, metabolism, and excretion of 14CO-labelled dimethoate were studied in rats and 3 species of insects (M. domestica L., Blatta germanica L., and Periplaneta americana L.). Phosphatidate oxidation was prevalent in rats, but the degradation rather than activating systems were predominant. Amide activity was more pronounced in rats than in insects immediately following treatment with dimethoate; this major metabolic difference may partially explain selectivity. Phosphatase activity was also more evident in rats than in insects. (From auth.)

557


Dimethoate* increases in toxicity to mammals on storage in certain hydroxylic solvents, particularly 2-alcohols. The reaction of dimethoate with 2-methoxyethanol at elevated temperatures yields at least 8 phosphores-containing toxic products, 2 neutral phosphites other than the original compound, and the diazides of N-methyl-methacrylamide. 14CO-labelled dimethoate was used prepared, purified and characterized as described in J. agric. Food Chem., 7, 1 (1963). No evidence was obtained for the formation of stable pyrophosphates. The product of highest mammalian toxicity was a 2-(2-methoxyacrylamide) phosphorothioate with one or both O-methyl groups replaced by O-(2-methoxyethyl) groupings. The toxicity to mammals of a few other phosphoroxyanate insecticides also increased on reaction with 2-methoxyethanol. Certain preparations of technical dimethoate contained an impurity, which somewhat increased the toxicity of dimethoate to several organisms, including the rat. Following oral administration, purified dimethoate reacted with liver chlorides or potassium di-O-dimethyl phosphorothioate yielding a dimethoate potentiator, probably through demethylation at the initial reaction. (Mostly auth.)

* Dimethoate (O,O-dimethyl 2-(2-methoxyacrylamide) phosphorothioate)
PHOSPHINOLYX, N-DIMETHYL-
(Aboin. 41). Bull. ent. Soc. Amer.

as mentioned. The main metabolite of methyl derivative of dinoseb, which fragments from the molecule will also

ETHANOL, A DEMETON INTER-
action of ethylene oxide and ethyl
the alcohol, which is an intermediate
nophosphonate). (From auth.)

PROPERTIES OF DIMETHOATE AND
reasoned, and characterized. Derivatives
ly, Musca domestica L., than the
number of carbon atoms, the toxicity
increased effectiveness of the dialkyl-substituted
resulted in increased stability to
active compound is a function of the
content of the methylthionathate
germicide (I, L), and Fungi:plant
the degrading rather than activating
It is true that in insects immediately
methyl phenyl thionathate yielding

ORTHOCINNAMIC INSECTICIDES WITH
hydroxylic solvents, particularly
at elevated temperatures yields other
other than the original compound,
thionathate was used (prepared, purified.
No evidence was obtained for the
a cyanogen was a 2-(2-methoxycarbonyl-
herbal compound, it is strongly.
also increased in reaction with
and it is not yet known why.


By means of radiological assays, bioassays and autoradiography it has been established that 45-calculated rogor, which is synthetically effective against several species of pests feeding on the leaves, bark and fruit, when applied to the trunk or stem of lemon plants, is readily absorbed, transported upwards and, together with its metabolites, translocated in high dosage into the branches and twigs, a very large amount into the leaves, in a smaller quantity into the flowers and fruit (borne on the peel) and in a very low concentration into the roots. Only the initially formed system and the path show no traces of 45-containing substances since almost the entire amount (about 97%) of the applied insecticide leaves the treated area of the trunk and migrates into other organs. The upward movement occurs mainly through the xylem and less through the phloem in which, however, a relatively large amount of radioactive compounds accumulates by radial transfer from the xylem. The translocation into the roots takes place mostly through the phloem. (From auth. summary).


Further investigations were carried out on the distribution of the translocated material after the application of 45-labelled rogor (diluted with water to 0.001-0.1%) to the whole surface as well as only a part of the surface of the leaves, fruits and twigs of citrus plants. There is evidence that, while the cell-to-cell movement into the tissues located just under the exterior parts which have been treated occurs over a very short distance but in relatively high concentration, the translocation through the vascular bundles occurs, on the contrary, over a great distance (mainly upwards and towards the growing organs) but, owing to the low dosage at which insecticide is applied, leads to relatively low concentrations of translocated material. (From auth. summary).


Autoradiographic and radio-isotopic techniques were used for studying the distribution and translocation of rogor in cotton and potato plants, fruit and leaves of olive trees, and fruit of peach sprayed with 45-labelled rogor. There is evidence that, following treatment, the insecticide and its metabolites occur in various concentrations throughout the various organs of the cotton plant, excluding the roots, and are concentrated in the bactrocera. These products also, synthetically, reach the unsprayed bolts and leaves. (From auth. summary).


After a review of the means and methods, based on sprays, oils, organophosphorus compounds, and with oil-organophosphorus combinations which are more frequently recommended for the control of citrus scales, results are reported for laboratory investigations conducted to determine the activity ofrogor 45 (initial specific activity: 1.84 mc/mg) against some species of armored and soft scales and mealybugs and to compare the effectiveness with that of parathion and other products. Data on field trials in citrus orchards infested by citrus mealybug (Ceroplastes citri) and citrus whitefly (Pseudococcus citri) are reported. Some work with 45-labelled rogor and autoradiography on the method of action of rogor and parathion on C. citri. mealybug indicated

6 di-methoxycarbonyl methyl phosphonothioate
that penetration of parthenium occurs through the rootlets, as a stomach poison, and through the "armour" or scale covering, as a contact poison. Hogar, on the other hand, does not reach the body of the insect through the scale covering but is absorbed as a stomach poison after its perstration and translocation, for a short distance, into the mesophyll of the leaf.


By using P-32-labelled dimethoate (total specific activity 1.43 mC/mg) the concentration of the translocated substance and the distribution of labelled compounds could be determined in many cases by radioanalytical and autoradiographic methods. The speed between effectiveness and physicochemistry of dimethoate applied to lemon, orange, tangerine, olive, apple, pear, cherry and peach was summarised in a table. In peach, following trunk application, the concentration of P-32 per cent as dimethoate and its degradation products (total P-32), and the concentration of P-32 which could be extracted by means of chloroform and is present as dimethoate and its P - O metabolite (P-32/CHCl) were determined. The concentration of both normal P-32 and P-32/CHCl reaches and maintains higher levels in the leaves (greater in the terminal leaves) than in the fruit. The temporal pattern of distribution of P-32 in leaves and its fruit (also measured) is discussed in some detail (figs. 6, 7, 8). The adverse effects of trunk application, and the influence of the formulation on the effects on pests and plants are discussed. The least damaging among the solvents tested evidently permits the transfer of P-32-labelled dimethoate and its metabolites from the trunk to the leaves. The astringence of the effect appears positively related to the speed of translocation of the active ingredient and to its maximum concentration in the leaves.


It was shown by radioactive, paper-chromatographic and autoradiographic methods that P-32-labelled hogar (together with tri-n-butylinphosphate), when applied to lemon tree trunks, was quickly absorbed into the outer part and translocated, mainly upwards. Metabolism of hogar followed essentially 2 routes: an oxidative one with formation of its P - O derivative, S II [N-dimethylcarbamoylmethyl] dimethoate, and a hydrolytic one bringing about the formation of several products (dimethylphosphoric acid and O-methyl-0-hydoxy S(N-methylcarbamoylmethyl) phosphorothioate). Favourably high concentrations of hogar were found in the leaves, moderately high ones in twigs and rather low ones in fruit. Concentrations were higher in the skin of the fruit than in the endocarp. Small quantities of P-32-containing substances, not chemically identified but not hogar or S II were found in the roots. Hydrolytic breakdown products were found from leaves and translocated upwards, mainly metabolised to O-methyl-0-hydoxy S(N-methylcarbamoylmethyl) phosphorothioate or the O-dimethylphosphorothioate, or both, can be absorbed by the root system of young lemon plants and translocated towards the epigeal organs, (From auth. summary).


Dimethoate was studied for use in the control of the olive fly, Dacus oleae (Gmelin), and proved to be both effective and safe. Metabolism of P-32-labelled dimethoate in olives and in olive yielding oil is very similar. In these fruits, dimethoate undergoes oxidation to the oxygen analogue (P = O derivative) [O-dimethyl-S-methylcarbamoylmethyl phosphorothioate] and hydrolysis to degradation products such as phosphoric acid or methylphosphonic acid or both. When dimethoate is applied to olives for viii, according to the recommended schedule, the oil is practically free from toxic residues. When dimethoate is applied to eating olives, the usual industrial process with NaCl produces further degradation and a strong extraction of the P-containing insecticidal residues, (Essentially auth.).

**Q**. Q. dimethyl S-(N-methylcarbamoylmethyl) phosphorothioate.


**Metabolism in the leaves was** c to follow essentially an oxidant of phosphoric acid, O - dimethyl O-hydroxy of S(N-methylphosphoric P-32-labelled substances of unlikely, known and unknown, varying after treatment, the OOR in the leaves. Of the total P-32 grown sugar beet, it is essential metabolite and to traces of OOR derivative for Apil fabae was ment. There is a considerable (From auth. summary).

Santi, R. PENTRAZIONE, TR TRUNKS. Cont. B. Rnc. 84.

Autoradiography, paper chromatography, paper chromatography, and autoradiographic methods that P-32-labelled hogar were quickly absorbed into the outer part and translocated, mainly upwards. Metabolism of hogar followed essentially 2 routes: an oxidative one with formation of its P - O derivative, S II [N-dimethylcarbamoylmethyl] dimethoate, and a hydrolytic one bringing about the formation of several products (dimethylphosphoric acid and O-methyl-0-hydoxy S(N-methylcarbamoylmethyl) phosphorothioate). Favourably high concentrations of hogar were found in the leaves, moderately high ones in twigs and rather low ones in fruit. Concentrations were higher in the skin of the fruit than in the endocarp. Small quantities of P-32-containing substances, not chemically identified but not hogar or S II were found in the roots. Hydrolytic breakdown products were found from leaves and translocated upwards, mainly metabolised to O-methyl-0-hydoxy S(N-methylcarbamoylmethyl) phosphorothioate or the O-dimethylphosphorothioate, or both, can be absorbed by the root system of young lemon plants and translocated towards the epigeal organs, (From auth. summary).

Ferman, S.E., Gilbert, B.L., The insecticide Q. O. Q. O. tests for use in biological studies, specific activity of 50.47 mC/g quantity represents a radio-ultra (Auth.)

Sharr, P.R. METABOLISM C ANNI. t. 8 (1962) 158.

The rates of hydrolysis of triis2 by whole insects and mammalian enzymes. By L. World E188.

Maisel, R.L., Kubota, T.R. RESIDUES. By L. World E188.

The activity of the insecticide was compared with dose of its application toxicity to 3 sunbirds, 1 and its products were immobile phase on Whatman the glycol. Spont were detect

Metabolism in the leaves was carried out by means of P^44-labelled active principle. Metabolism was found to follow essentially an oxidative and a hydrolytic course, with the formation of the P-O derivative, and of phosphoric acid. O-Q-dimethylphosphonic acid, O-Q-dimethyphosphonothioic acid and D-methyl, O-hydroyl of S-(6-methylcarbamoylmethyl) phosphonothioate respectively. The presence of other P^44-labelled substances of unknown composition was also noted. The concentration of Rogor and its metabolites, known and unknown, varied in turn with the time interval between treatment and sampling. Even long after treatment, the O-Q-dimethylphosphonothioic acid is the component with the highest concentration in the leaves. Of the total P^44 present, only a small percentage was discovered in the roots of the field-grown sugar beet. It is essentially localized in the vascular tissue, and can be attributed to an unknown metabolite and to traces of O-Q-dimethylphosphonic acid. The threshold of toxicity of Rogor and its P^44 derivative for Aphis fabae was between 0.2 and 0.3 ppm. These levels are still present 164 days after treatment. There is a considerable safety margin from the health point of view in using Rogor as described. (From auth. summary).**

**Santi, R. PENETRATION, TRANSLATION, AND METABOLISM OF ROGOR-P^44 APPLIED ON LEMON TREE TRUNKS. Crop. Int. Rec. agr. Soc. Montecatini 5 (1963) 47-60. (in Italian).**

 Autoradiography, paper chromatography, and radiometry showed that a formulation of Rogor-P^44 (1) with 80% DCBP was quickly absorbed and translated, mainly upwards, when applied on lemon tree trunks. Metabolism of 3 followed 3 routes: (i) oxidation with formation of its P-O derivative, (ii) (ii) oxidation giving O-Q-di-l-methyl phosphonic acid, O-Q-di-l-methyl phosphorothioic acid, O-Me-O-H S-(6-methylcarbamoylmethyl) phosphorothioate, and H_2PO_4. Concentrations of P were extremely high in leaves, moderately high in twigs, and rather low in fruits, being higher in the skin than in the endocarp. Presence of P and H in the roots had to be excluded. (CA 66:1964, 7264h)**

**II - D - 1 ETHION**

**567 Forman, S.E., Gilbert, B.L. ETHION-P^44. J. agric. Food Chem. 3, 4 (1961) 260-2.**

The isomeric O,O-Chl, C_4-tetramethyl 5,6-methylene biphosphonitrate-P^44 (Ethion-P^44) was prepared for use in biological studies. The product obtained from 3 of H_2PO_4 contained 78% of the P^44 with a specific activity of 37.4 mC/mg. When allowance is made for decay of the P^44 (half-life 14.3 d), this quantity represents a radio-yield of 35%. Estimated vapour pressure of ethion was 1.5 x 10^-6 mm at 25°C. (Auth.)

**II - D - J FAMOPHOS**

**568 Sierra, P.R. METABOLISM OF FAMOPHOS IN MAMMALS AND INSECTS. (Abstr. 49). Bull. ent. Soc. Amer. 9, 9 (1965) 155.**

The rates of hydrolysis of infrared Fampophon, dimethyl 4-(dimethylamino) phenyl phosphorodithioate, by whole insects and mammals were examined, and the results correlated with toxicity.

**II - D - K FENTHION**


The activity of the insecticide fenthion, O-Q-dimethyl O-(4-(methylthio)-m-toly) phosphorothioate (1), was compared with that of its principal oxidation product, P^44-labelled 2 and its oxidation products were applied topically to 3 strains of houseflies and tested against larvae and adults of 2 species of mosquitoes. 1 and its products were separated by paper chromatography, using pyridine glycold as the immobile phase in Whatman No. 1; the mobile phase was hexane-toluene (7:3 vol/vol), saturated with the glycold. Spots were detected by spraying with 9% 2,4-dibromo-5-chloroanisole in anise and heating,

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*Note: The original text contains several references and citations that are not translated or are not clear due to the nature of the documents. The provided text is a summary or translation of the extractable content.*
and by biosynthesis, using mosquito larvae, of 1-cm sections of the paper. Results indicate that the oxidation products are unstable in H₂O and that I is a weak in vitro inhibitor of cholinesterase. It was unstable when exposed to sunlight and air, yielding 11 compounds, most of which are H₂O-soluble. Heating at 140° in an atmosphere of N₂ caused a rapid breakdown of I, yielding the 5-methyl isomer primarily. Metabolism studies, using cotton plants and adult female houseflies, demonstrated that I is readily oxidized, as a serious residue or in plant and animal tissues, to sulfone and sulfoxide derivatives.

(CA 66: 1964, 3403b)

II-D-1 LEBAYCID


The active ingredient \( \text{I} \), \( \text{O}-\text{dimethyl-O-(3-methyl-4-pyridyl)methylcarbamoyl}) \( \text{H}_{2} \text{PO}_{4} \text{(1)} \). Following application of \( \text{I} \) labelled Lebaycid (available at a specific activity of 2.4 mCi/g) on plants (Phaseolus vulgaris), 4 oxidation products of \( \text{I} \) were obtained, namely sulfone (II) and sulphone (III) of \( \text{I} \) as well as sulfoxide (IV) and sulphone (V) of the oxygen-soluble phosphate forms, were detected by paper chromatographic separation of purified plant extracts. By measuring the distribution of radioactivity on the paper chromatogram, it was possible to determine the 4 oxidation products quantitatively. The \( \text{I} \) labelled active ingredient contained \( \text{~9} \% \) of 5-methyl isomer VII. This compound is also oxidized to sulphone (VIII). Isomerization to 5-methyl compounds in the plant was not observed, however. Immunoassay of the roots of young plants in Lebaycid solution and a study of the velocity of penetration after application on the leaf proved that the preparation has a slight systemic action. The quantitative study of the influence of light, plant enzymes and temperature on the transformation of \( \text{I} \) revealed that oxidation at the position of the methylcarbamoyl group is strongly influenced by the temperature, while plant enzymes mainly oxidize the active ingredient at the position of the thione-sulfur atom of phosphenyl acid. Isomerization to 5-methyl compounds takes place only at high temperatures.

II-D-10 MALATHION


A field survey of two 20-acre watersheds was conducted during the summer of 1961. In May of 1960, one of the watersheds was treated with an application of 2 lb technical-grade malathion per acre in a formulation of sulfate, triton X-115 emulsifiers and water, \( \text{I} \) labelled malathion (specific activity 17.5 mCi/ml) was applied aerially (1.5 of activity) to one of the 20-acre forest areas. The distribution of components of the spray was measured within the forest. Electrically operated air samplers provided estimates of drift off the area; helium-filled balloons bearing florescent glass discs measured above-canopy application; glass discs suspended vertically as well as bare samples measured quantities settling out at different layers in the canopy; glass discs and spotting-stained paper not only allowed a measure of horizontal distribution but a check of a standard spray-distribution detection device. Soil samples and monitoring of marked staves allowed sub-surface distribution studies. Samples of water from the intermitent streams, insects, mammals, reptiles and birds indicated the initial and subsequent distribution of the insecticide and its metabolites in the ecosystem. Population studies of the fauna continued throughout the summers of 1961-62 and a limited amount of survey data will be collected in the summer of 1963. Preliminary results indicate that the insect populations returned to normal in about 8 weeks and there was no detectable effect on the densities of the vertebrate animals on the sprayed area. (From auth.)
II-D-2 PARATHION AND MESTYL PARATHION


SKF 585A (β-dithiolanemethyl 2,2-diethylvalerate hydrochloride) protects mice against poisoning by the 3 phosphonofumimides compounds tested. Of the 6 phosphorothionates tested, protection against diethetone only was observed. With houseflies and American cockroaches, SKF 585A gave no protection against any phosphorothionates. SKF 585A inhibited the conversion of parathion into paraoxon by mouse-liver stafes or cockroach guts. SKF 585A inhibited the "activation" of chlorpyrifos by cockroach guts, as had previously been shown for rat-liver preparations. With mice and cockroaches in vivo, SKF 585A increased the concentration of parathion caused by the injection of parathion, and reduced the degradation of injected parathion. It was concluded that the diverse effects of SKF 585A on organophosphate toxicity in various species were due to the variations in the importance of "activating" as opposed to degrading enzymes. Labeled parathion (0.1% in propylene glycol) was used in the study, and injected into mice and Periplaneta americana at 5 mg parathion/kg. Labeled Parathion was prepared by passing N2O for 5 min at room temperature through a solution of labeled parathion in 19 ml methylene chloride, as a first step 1 mg labeled parathion/kg was injected into the animals.

Knaak, J.R., Schmaun, M.A., Casida, J.E. PEROXIDASE AND ETHYLENEDIAMINETOCTAETHACIC ACID-FERRIC IRON CATALYZED OXIDATION AND HYDROLYSIS OF PARATHION. J. agric. Food Chem. 10, 6 (1962) 154-9. Peroxidase and the ethylenediaminetetraacetic acid-ferric iron (EDTA-Fe3+) complexes were investigated for their ability to catalyze the oxidation and hydrolysis of parathion in the presence of an active hydrogen donor. Peroxidase catalyzed a 10% oxidation of parathion to para-oxon, while 5% conversion was maximum for the EDTA-Fe3+ complex. In addition to this oxidative conversion, peroxidase catalyzed the hydrolysis of 36% of the paraoxon and the EDTA-Fe3+ complex hydrolyzed 69%. Para-oxon was more stable than paraoxon to this hydrolytic attack. The EDTA-Fe3+ complex catalyzed 12% hydrolysis of paraoxon whereas peroxidase catalyzed the hydrolysis of 5% Peroxidases in plants may play a role in the metabolism of phosphotungstate and related phosphonothionates. Labeled parathion and para-oxon were used. (From auth.)


II-D-0 PHOSPHAMIDON

Anbinder, R., Beriger, E., Schmid, K. DIE SYNTHESSE VON 14C-MARKIERTEM PHOSPHAMIDON, EINEM NEUEN SYSTEMISCHEN INSEKTIZID. (The synthesis of 14C-labeled phosphamidon, a new systemic insecticide). Experientia 17, 11 (1961) 485-9. (In German). Starting with 14C-labeled barium carbonate, phosphamidon III (O,C-dimethyl-C-(3-chloro-2-dimethylcarbamoyl-1-methylvinyl)-phosphate) was synthesized in 6 steps (see Helv. chim. Acta 44, 1961, 1922). A yield of 60% was obtained, with the high specific activity of 12.1 mc/g.


The synthesis of phosphamidon, a new systemic insecticide, is described. By use of the 14C-labeled compound it is shown that in the bean plant phosphamidon undergoes rapid degradation, during which traces of the metabolites desethylphosphamidon, 3-cloro-3-dimethylcarbamoyl, and 3-chloroacetacetoxyethylcarbamate only are detectable. In order to explain the mechanism of the degradation reactions, the behavior of phosphamidon towards acids and bases was studied. (Auth.)

* 3-chloro-3-dimethylcarbamoyl-1-methylinyl dimethyl phosphate

V. The metabolism, deposition of residues in tissues, excretion rates and stability of Reszine® (4-tert-butyl-2-chlorophenyl methyl methylphosphonothioate) and Bays 22468 (2,6-dichloro-4-nitrophenyl methylphosphonothioate) in sheep were investigated. In one experiment, 3H-labelled Reszine at 50 mg/kg was administered orally. In other experiments, 32P-labelled Bays 22468 and Reszine were administered orally and the + sheep sacrificed 7 days after treatment. Reszine residues in several tissues were below 0.4 ppm, while Bays 22468 residues were below 1.0 ppm. Reszine was degraded at the P-O-C and the P-N bond forming at least 8 hydrolytic products, 4 of which were identified. Bays 22468 underwent oxidation at the P-O group and hydrolysis at the P-O-N bond. When Bays 22468 and Reszine were formulated as polypropylene and administered to sheep, there was reduced intestinal absorption of these toxicants, a decrease in the quantity of residues in internal tissues, the phosphate of the toxicants did not undergo enzymatic degradation, and a larger percentage of the administered material was eliminated in the faeces. The mutagenic efficiency of Reszine and Bays 22468 formulated as polypropylene was compared with standard commercial water-soluble powder and liquid feed formulations.


Sarin (isopropyl methylphosphonofluoridate) is an enzyme inhibitor similar to DFP, penetrates intact skin. From the autoradiographic studies presented here, and from many others made in this laboratory, no evidence has been obtained to show that sarin penetrates preferentially through the hair follicles. Penetration appears to be primarily transdermal. The autoradiograms are similar to those of sarin applied to the intact skin during life (rabbit) or to skin excised after death. Intracranial injection of sarin into the skin limits the penetration of sarin through the skin. Evidence is suggestive that a high concentration penetrates into the dermis during a period of only 5 min when these is even the most superficial break in the barrier. No such penetration through normal, unexposed skin could be demonstrated after 30 min. (Adv. concl.)


The isopropyl (Sarin) and 1-methylbutyl (IV) and 1-methylerythyl (II) derivatives of methylphosphonofluoridate were investigated. TiH-labelled inhibitors were synthesized according to Collong (Biochem. Soc. Trans. 6:1, 1962). In rabbits, 3H-labelled inhibitors were used in hydrophilic compounds. With dogs and cats no differences are noted between PC administration and low, intravenous infusion of 1 in regard to symptoms, respiratory, and cardiovascular disorders, or gross pathology. Acetyl-cholinesterase of arterial blood erythrocytes and butyryl-cholinesterase from plasma are inhibited to a maximum of 70 to 80% in 10 to 30 min following PC application. PC application effects local granular fibrillation and subcutaneous edema and hyperemia. Dilatation and increased permeability of cutaneous blood vessels are explained by inhibition of acetylcholinesterase. Washing the guinea pig skin with a 10% soap solution after application of 1 enhanced survival. LD50 in the guinea pig is in mg/kg body wt. For PC application the compounds at 0.5 cm are: I, 5.6; II, 6.1; III, 8.6; IV, 8.6; for intravenous injection of aqueous solutions, 0.297, 0.932, 0.104, and for subcutaneous injection of aqueous solutions, 0.056, 0.029, 0.038, respectively. Causing PC administration compounds necrotic lesions were obtained for their disappearance rates from the skin following PC application at 0.004, 0.016, 0.0088 in 64. Radiative material is found diffusely throughout the dermis and concentrated in hair follicles. Butyrylcholinesterase from cat plasma was inhibited 60% by about 3 x 10^-8 M I, II, or III. The acetylcholinesterase activity of the dermis in different species was estimated for mice, rat, guinea pig, rabbit, cat, and dog. The spontaneous hydrolysis of I, II, and III, 3.5 x 10^-6 M in 0.5 M HCI, and their hydrolysis by homogenates of dermis from the guinea pig were determined at pH 7.0, 7.5 and 8.5. H, 156; and 186; H, 8.

McMAHON, M. K., ADIE, F. TISSUE OF RABBITS TRIA.

STIMULANT. J. Biochem. Physiol. Studies have been made of at a constant concentration using different sizes of cope (60% of the animals exposed was possible to determine if and exposure time to 15 min. (Authors.)

SAITOU, L., RAHALLER, G. W. OF 32P-LABELLED SCHRADE INDIAN J. H4. 52, 8 (1986) This little was known of the small depositsque had been on the base was found to be directly related to the duration of exposure, was some variation in individual toxicity. The higher concentration was the more toxic the more testicular damage was seen to extend with the amount.

KIVASTE, J. DETERMINATION OF THE TECHNICAL PRODUCTS OF ORGANOPHOSPHORUS CHEMISTRY. J. Chromat. 21 Technical (C) and (B) are the amounts of (C) the (p-phenyl) phosphate (3), and several (B) sources products are separated from taking 1.4 volume % secane, respectively. The by and determined product to give the 1:1 mixture may be prepared by paper or with an equal volume of MT. The partition coefficient of PH: 325/9.

MIYAMOTO, J., SAIO, Y., K ORGANOPHOSPHORUS C MARYL PARA THION IN GI 325-9. An explanation was sought for the high phosphorous in the animals 32P-labelled derivatives and germinates (L.), and rice. A
determined at pH 7.8 and 37°C and expressed as half-life in min. The average for each was 220 and 126, 120 and 138, 380 and 178, respectively. (From CA 46: 1962, 1718g)


Studies have been made of the penetration of P labelled Sarin through the skin of rabbits. Sarin vapour at a constant concentration was passed through a plastic cup attached to the clipped bellies of rabbits. Using different sizes of cups it has been found that the Log (t) (concentration at exposure time required to kill 50% of the animals exposed) decreased as the exposure area was increased. From these experiments it was possible to determine how absorption through skin varied with area exposed, vapour concentration, and exposure time and to find the approximate exposure necessary to kill a rabbit for any area of skin exposed. (Auth.)

II-C-1 SCHERADAN


Since little is known of the contact effect of scheradan on insects or the extent to which they pick it up from deposits, scheradan labelled with P was used to prepare films on filter papers, and adults of Dicyclohexanone were released on these and observed for mortality daily at a temperature of about 30°C. Uptake was found to be directly related to the concentration of the solution used (0, 1.543, 0, 21 and 0, 1.195g) and to the duration of exposure, but it was also affected by the number of insects exposed per unit area. There was some variation in individual susceptibility of the insects, but the amount picked up from deposits of the higher concentrations was usually more than sufficient to kill them. After being picked up by contact, the insecticide became distributed in the body by way of the haemolymph, and it was eliminated to some extent with the excreta.

II-C-3 SUMITHION


Technical Q 58-P-Me-C-(3-methyl-4-nitrophenyl) thio phosphate (P, an insecticide, contains also various amounts of Q 58-P-Me-C-(3-methyl-4-nitrophenyl) thio phosphate (I), Q 58-P-me-C-(3-methyl-4-nitrophenyl) thio phosphate (II), Q 58-P-Me-C-(3-methyl-4-nitrophenyl) thio phosphate (III), Q 5-methyl-4-nitrophenol (IV), Q 58-P-Me-C-(3-methyl-4-nitrophenyl) thio phosphate, and several 8-alkyl isomers which interfere in the direct determination of I by polargraphy. These by-products are separated from I by thin-layer chromatography on SiO2 with petroleum ether (b. p. 60-80°C) containing 1, 4 volume-% acetone. Rf values of 0.71, 0.36, 0.66, and 0.16 were obtained for I, II, III, and IV, respectively. The by-product spots, viewed in ultraviolet light, are eluted from the plate with MeOH and determined polargraphically in water, and the curve obtained is subtracted from that of the technical product to give the I content. The maximum error of the method is 4%. 858-labeled I in technical I may be purified by paper chromatography with the system olive oil-acetone, dissolved in hexane, and shaken with an equal volume of MeCN; I remains in the MeCN layer and the oil remains in the hexane layer. The partition coefficient of I in this system is 40. (CA 69: 1968, 1431h)


An explanation was sought of the low mammalian toxicity of Sumithion (Q 58-P-dimethyl-C-(3-methyl-4-nitrophenyl) phosphorothionate, also known as Bayer 4133) or (Folthion). Experiments were made using P labelled Sumithion and methyl parathion on guinea pigs, rats, the German cockroach, Blattella germanica (L.), and rice followed by chromatographic separation and identification of metabolites in the
success. Results of such in vivo studies indicated that the comparatively low mammalian toxicity of Simeticone is probably due to the ability of the mammal to degrade the insecticide in a more efficient manner than insects.

II-D-t  THIMET


\( ^2 \text{P} \)-labelled Thimet (phosdrin) was applied to barley plants in a greenhouse experiment, by either painting the leaves, including the soil, or treating the seed. Autoradiographs confirmed penetration in every case, with translocation throughout the entire plant and a markedly higher level of radioactivity in the upper part of the leaves. Optimum insecticide concentrations, such that the plant was not damaged, with yet enough to obtain satisfactory autoradiographs (phosdrin 1.1 mcg/mm), were found to be as follows typical application to leaves 2% of the product in an emulsion consisting of a derivative of sulfolactone polyethylene glycol, xylol, and water; irrigation - same emulsion but 0.5% phosdrin; seed treatment - same emulsion but 0.5% phosdrin when the seeds were soaked, and 2% (with reference to seed weight) when activated charcoal was used.

II-D-t  TROLENE


Experiments were conducted on the toxicity of Dicophene (Bayer L 26/26, O,O-dimethyl-2,9-dichloro-1-bis(methoxyphosphoryl)-phosphoric acid) to Amblyomma maculatum Koch, and of Troleone (Dow ET-37, O,O-dimethyl-2,4, 5-trichlorophenylphosphoric acid) against hypodermis bovis (DeVillis). Part of the thesis is concerned with investigations into the systemic action of \( ^2 \text{P} \)-labelled Troleone in domestic rabbits. These were treated with 50, 75, 100 and 200 mg radioactive Troleone/kg body weight. Blood samples were collected from the marginal ear veins at intervals, and simultaneously 25-25 pentobarbital sodium were allowed to take blood samples from the treated rabbits. Percentage mortalities of these bugs were used for bioassay studies. The quantity of radioactivity in the blood fluctuated (3 to 4 peak concentrations but no leveling off), bioassay indicated fluctuating levels of toxicity, not consistently correlated with radiological assay. Some mechanism might limit the absorption of chemical through the gut wall into the blood stream. When concentrations of radioactive material in the blood reached high levels, blood collected using vacuum had more viscous and clotted faster than normal, and bugs fed slowly or not at all. Rabbits died when the radioactivity chemical in the blood reached the concentration levels 18.6, 20.6, 41.6, 72.4, and 107.0 mcg/ml.

II-D-t  VARIOUS

597  Dedek, W. DIE DARSTELLUNG \( ^3 \text{P} \)-MARKIERTER PHOSPHORAMIDE ALS AUSGANGSMATERIALZUSANZ FUR SYNTHESEN \( ^5 \text{P} \)-MARKIERTER PHOSPHORORGANISCHER INSECTIZIDE. (Preparation of \( ^3 \text{P} \)-labelled phosphorous bromides as starting materials for the synthesis of \( ^5 \text{P} \)-labelled organophosphorus insecticides). Isotope Tech. 1, 7 (1963) 195-6. (In German).

Detailed procedures are given for the preparation of products with specific activity depending on the yield of the reaction and the specific activity of the labelled P used. \( ^3 \text{P} \)O \( 4 \) was prepared in 69-75% yield from labelled red P and Br in Cs. \( ^3 \text{P} \)Cl \( 4 \) was prepared similarly and treated drop-wise, with cooling, with a solution of absolute ECH in CS, to give 87-90% \( ^3 \text{P} \)Cl \( 4 \). \( ^3 \text{P} \)Br \( 4 \) was prepared in 57-60% yield by adding Br to a suspension of red \( ^3 \text{P} \)O \( 4 \) and AlCl \( 3 \) in CS. (CA 69: 1805, 18152P).


A semi-micro method for the \( ^3 \text{P} \)-hydroxyl labelled HP \( 4 \) and PC organophosphorous insecticides.

599*  Kühnitzky, J.L.; Weinsteil, A. CHLORIDE. J. Amer. Chem. As.

As a starting point for the synthesis is described, starting specific activity (0.75 mcg/mg) conversion into \( ^3 \text{P} \)-labelled tri

600  Dedek, W., Grimm, F., K/--UNG: DARSTELLUNG DER \( ^3 \text{P} \)-MARKIEREN PROTOVEREINIGUNGEN. J. chemic. As.

As the various steps in the synthesis graphic separation procedure of the isomers and of their oxidation analysis subsequently.

601  Dedek, W. RZAMOTIVIEN UN PHOSPHOR ORGANISCHEN VERBINDUNGEN. J. Amer. Chem. As.

The various steps in the synthesis are described in traceable graphic separation procedure of the isomers and of their oxidation analysis subsequently.

602  Dedek, W., Kühnitzky, M., RA VERHALTEN VON \( ^3 \text{P} \)-MARKIEREN AM RHIZOMEN. (Radiocative-labeled intravenous or transmuscular in the various steps are described which contains yttrium \( ^3 \text{P} \) where different steps are \( ^3 \text{P} \) coefficient. Results indicate the

603  Kovacs, J., Novomazska, K. R DITHIOPHOSPHORIC ACID ET.

Four experiments were carried which contains yttrium \( ^3 \text{P} \) where different steps are \( ^3 \text{P} \) coefficient. Results indicate the

604  Dubini, M. SYNTHESIS OF \( ^3 \text{P} \). (1968) 1421-2.

\( \text{NaClO}_3 \) \( ^3 \text{P} \) \( \text{SICH}_{2} \text{COCl} \) \( \text{CIT} \) (a) analogous inactive compounds, 0.45 g red irradiated P, and 1.5 g methyl esters MeCO add
A semi-micro method for the preparation of $^{32}$P-labelled di-HNa 2-naphthyl phosphate and POCl$_3$ from hydrated labelled H$_3$PO$_4$ and PC1$_3$ is presented. This represents a stepping stone in the synthesis of labelled organophosphorus insecticides.


As a starting point for the synthesis of certain $^{32}$P-labelled insecticides phosphoric acid bisesters is required. A method is described, starting with the dehydration of aqueous $^{32}$PPO$_4$ for obtaining $^{32}$PPOCl$_3$ of high specific activity (0.76 mc/mg) and chemical purity (97%P). The specific activity was determined by conversion into $^{32}$P-labelled triethyl phosphate and subsequent assay.

Phosphoric acid esters


The various steps in the synthesis of this systemic insecticide are described, and details of the chromatographic separation procedures given. The hydrolytic breakdown products of the $^{32}$P- and $^{32}$O-labelled isomers and of their oxidation products are traced. Tomato plants were treated in the field and their residue analyzed subsequently.


The preparation is described of $^{32}$P-labelled phosphoric trichloride (P$^{32}$Cl$_3$) which, in turn, can be used to give dimethyl phosphate (CH$_3$PO$_4$Cl$_2$) from which Dipetene (CH$_3$O$_2$PO$^{32}$-CH$^-$CH$^-$C$^-$Cl) and DOVP (dimethylchloroethyl phosphinate) (CH$_3$O$_2$PO$^{32}$-O$^-$CH$^-$CH$^-$C$^-$Cl) can be obtained. Selective extraction of Dipetene breakdown products from an aqueous solution is described.

592 Dedek, W., Kleinert, M. RADIOAKTIV MARKIERTE PHOSPHORSÄUREESTER. III. MITTEILUNG: DAS VERHALTEN VON $^{32}$P-MARKTIERTEM WOUTERI BEI INTRAVENÖSER UND INTRAMUSKULÄRER INJEKTION AN EINHEITEN. (Radioactive-labelled phosphoric acid esters, III. The fate of $^{32}$P-labelled Wouteri following intravenous or intramuscular injection to cattle). Zeitschr. Tech. 5, 8 (1965) 307-9. (In German).

Four experiments were carried out with intravenous and these with intramuscular injection of "Rubelin" which contains Wouteri $^{32}$P-dimethyl-1-hydroxy-2,2,2-trichlorophosphate. The data obtained from the different series are plotted. The radioactivity of extracts was corrected by a distribution coefficient. Results indicate the absence of serious persisting side effects when "Rubelin" is injected.

593 Kowac, L., Novomeska, E. REPORT ON THE SYNTHESIS AND APPLICATION OF $^{32}$P-LABELLED DIAETHYL-DITHIOPHOSPHORIC ACID ESTERS. Széchenyi Im Reig für gefangige Wirtschaftsfähige, Sofia 1961. Thio phosphoric esters


(Me$_2$CO)$_2$C(O)SClPO$_4$Cl$_2$ (I) and (Me$_2$CO)$_2$P(O)SClPO$_4$Cl$_2$ (II), useful for the biochemical study of the analogous insecticidal compounds, that have interest as insecticides were prepared. To prepare I (int. 561 501) 0.45 g red irradiated F and 1.18 g 6 was heated 3 h at 200° in CO$_2$ atmosphere and cooled. 10 ml toluene and 2 ml anhydrous Me$_2$SO added, and the mixture maintained 3 h at 80°. The filtrand liquid was aminated.
Studies on the selective toxicity of schradan. (Saito, 1963)

The penetration and metabolism of Tihadan in M. domestica. (Bane, 1963)

Use of radioisotopes in studying the absorption, distribution and elimination of certain insecticides in animals. (Fakashy et al., 1963)

Metabolism of O,O-dimethyl O-[4-(methylthio)-m-toly] phosphorothioate by white rats. (Brady and Arthur, 1961)

Studies with 14C-labeled Bay 52408 in maize and guinea pigs. (Ghersini et al., 1963)

Metabolism of 14C in selectivity of organophosphorus insecticides. (Angelev, 1961)

Labeling studies. V. Uptake of triphenyl phosphorothioate (23P) by leucocytes. (Karth et al., 1961)

The distribution and excretion of 14C-labeled diethox in guinea pigs. (Kaplan et al., 1961)

Detection and distribution of 14C labeled diethox in dog tissues after oral administration. (Mills, 1963)

Rumen bacterial and protozoal responses to insecticide substrates. (Williams et al., 1963)

The metabolism of 14C-labeled dimefox in sheep. (Chamberlain et al., 1961)

Studies on influencing metabolism and on the precipitation mechanism of the phosphoric acid ester, trichlofen in the commercial product "Hanilin" with the help of BC-labeled phosphor in the intravenous and intramuscular injection to cattle. (Kakovick et al., 1963)

Absorption and elimination of General Chemical 4675 applied dermally to cattle. (Chamberlain and Hopkins, 1962)

The metabolism of orally administered malathion by a lactating cow. (O'Brien et al., 1961)

New tracer techniques for evaluating the effect of an insecticide on the ecology of a forest fauna. (Peters and Gils, 1961)

Studies on the percutaneous absorption of paraoxon and paraoxon. II. Distribution of 14C labeled paraoxon within the skin. (Fredriksen and Bigelow, 1961)

Tracer distribution of 14C-labeled paraoxon. Autoradiographic techniques. (Fredriksen and Bigelow, 1961)

Penetration and metabolism of two organophosphorus insecticides by the organs of warm blooded animals. (Gar et al., 1959)

Metabolism of 2,3-dichlorovinyl dimethyl phosphate in relation to residues in milk and mammalian tissues. (Casida et al., 1952)

Mammalian enzymes involved in the degradation of 2,3-dichlorovinyl dimethyl phosphate (DDVP). (Hodgson and Castle, 1963)

Metabolism of organophosphate insecticides by plants: a review. (Casida, 1963)

Annual report of the West African Cocoa Research Institute, 1959-60. (West African Cocoa Research Inst., 1961)

Studies on the translocation of radioactive schradan in plants and its uptake from films by insects. (Chambers et al., 1961)

Phosphate accumulation by cotton plants and recovery from soil. (Hacskaylo et al., 1961)

Dimethoate absorption and its translocation and distribution in the cotton plant. (Hacskaylo et al., 1961)

Metabolism of dimefox in cotton leaves. (Hacskaylo and Bull, 1963)

Evolution des dépôts superficiels, diffusion et dégradation de deux insecticides endo- et exthoraciques: le défenset et Endosulfan dans quelques plantes maraîchères. (Hacskaylo, 1963)

Absorption and translocation of phosphorus and phosphates by cotton seedlings. (Lindquist et al., 1951)

Laboratory and field investigations with phospho-treated cottonseeds. (Lindquist et al., 1961)

Systemic activity of dimefox applied to cotton seeds. (Lindquist et al., 1961)

Absorption and translocation of Di-Symto by cotton plants. (Tao and Clark, 1961)

Absorption and movement of phosphorus-32 labeled systemic insecticides in the grape vine (Vitis vinifera L.). (Coombs, 1962)

L'élaboration des processus d'absorption et diffusion des insecticides systématiques au Populus eumauco (Cassin) et Eucalyptus mitchelliana (L.) Le Maun. (267) (Sanchez et al., 1962)

Le problème de malathion. (Bouroz and Tanou, 1962)

Metabolism rate of malathion and methyl paraaxon in rice plant. (Tomizawa and Saito, 1962)

 Fate of O,O-dimethyl O-[4-(methylthio)-m-toly] phosphorothioate on tea and cabbage leaves. (Tomizawa et al., 1962)

Fate of and metabolism of radioactive 4-tert-butyl-2-chlorophenyl methyl methylphosphonamidate administered as a single oral dose to sheep. (Habermach and Sway, 1962)

Residues in the milk of dairy cows sprayed with 14C-labeled general chemical 4072. (Roberts et al., 1961)
II-E Pyrethrin and Related Compounds

II-E-2 PYRETHRIN


(C216H27O32) pyrethrin I, labelled in the cyclopropyl ring adjacent to the ether linkage, was prepared by the centrifugation of (C216H27O32)-pyrethrins monomethyl ester with the pyrethrin. Details of the procedure are given. Because of the small amount of material available the (4,4-transe) acid could not be resolved and the final product was a mixture of natural pyrethrin I and one of its diastereoisomers, henceforth referred to as (C216H27O32) pyrethrin I. Sub-lethal quantities of (C216H27O32) pyrethrin I in acetone were then applied by topical application to batches of flies of three strains. Results indicate that there is a definite correlation between the rates of absorption of (C216H27O32) pyrethrin I and pyrethroid resistance in the strains studied here.


Pyrethrin I, labelled with C14 derived from mevalonic acid-2-C14 in vivo (CA 56, 2744), yielded chrysanthemic monomethyl ester-C14 (I) on alkaline hydrolysis without loss of radioactivity. Oxidation of I gave MeCO-C2-C14 and carboxylic acid-C14 (II). MeCO was converted to C2-C14 HOAc, and Kuo-Hob unit oxidation of II gave AcOH with 50% of the radioactivity of II. This confirmed the sites of C14-labelling in I to be as shown and established that I was formed in the plant from two isopentenyl units. (CA 56: 1963, 11468c)
Levy, W.L., Mason, M.O., Muggia, P.M., Jimeson, J.O. *Pyrethrum Pest* 5 (1969) 8–

On the breakdown and synthesis of naturally occurring pyrethrum insecticides.

II-EB BOTTONONE


Reaction of ethyl bromoacetate-1-C14 with diallyl yielded debromoethane-2-C14 in 50% yield. Sodium borohydride reduction gave aminol, and subsequent Oppenauer oxidation yielded aminocarotenone-3-C14 (see Miyano and Masuda, *B. Sci.*, 81: 1958, 2044) in about 36% yield. Heating the aminocarotenone gave natural carotenone-3-C14 in about 10% overall yield from ethyl bromoacetate-1-C14.

II-F Nicotine, Carbamates and Other Compounds


Metabolism of nicotine in the tobacco plant has remained largely unexplored, although it has been demonstrated that the alkaloid is not an exact plant constituent but can be converted to other materials. In the present study C14-labeled nicotine was supplied to tobacco plants and nicotine, nicotine acid, and cotinine were isolated after periods of metabolism of 4, 7, or 14 days. Approximately 60-80% of the total radioactivity fed to the plants was recovered as nicotine dipeptide in all experiments. Nicotinic acid isolated as the hydrochloride, contained a significant amount of isoprene. The production of nicotine acid from nicotine in the tobacco plant suggests that the alkaloid may serve as a reserve source of this compound. A species of *Amylobacter* resembling *Amylobacter oxydans* was isolated in the nutrient medium in which tobacco plants had been grown. The bacteria catalyzed the production of 6-hydroxynicotine in approximately 80% yield from nicotine in a medium containing nicotine, inorganic salts and a small amount of yeast extract. The significance and implications of the findings are discussed.


Tobacco plants (Nicotiana rustica) were fed acetate-2-C14 (I) and succinate-2,3-C14 (II). Specific degradations of nicotine were carried out for isolation and assay of carbon 2, 3, and 6 of the pyridine ring. With II, the percent distribution of activity was 21, 40, and 39, respectively, and with I, 38, 39, and 7. It is suggested that carbon 3 and 2 of the pyridine ring arise from the methyl carbon of succinate or a closely related acid. (CA 59: 1963, 14955c)


In experiments with Nicotiana tabacum, intensive synthesis of nicotine (I) follows the use of C14O2CO (II) or C14H4N2O3HCl (III) as substrate. II enters the pyridine and pyridolide rings, whereas III is only incorporated in the pyridolide ring. 1-Commun retains roughly constant due to both synthesis and breakdown. When the seeds mature there is not only incorporation of I from the vegetative organs but biosynthesis of I also takes place. (Translated from Chem. Zbl., 1962, 134: 1963, 19238, MB)


Omnil: 3,5-C14, glutamine-2-C14, proline-C14, and putrescine-4-C14 have been found to be efficient precursors for biogenesis of the pyridolide ring of nicotine. The objective of the present study was to
investigate the participation of \( \Delta^1 \) - PC-3 in the biosynthesis of nicotine. \( \Delta^1 \)-pyridine-3-carboxylic acid-S-C\(^4\) was synthesized, isolated as a hydrochloride and fed hydroponically to latent 3 months old tobacco plants. Each plant received 1-2 mg of \( \Delta^1 \)-PC-3: HCl-S-C\(^4\) (2.0 - 4.5 \times 10^6 \text{cpm})

The isolated nicotine was radioactive, specific activities ranging from 4.5 to 0.4 \times 10^6 \text{cpm/mg} which corresponds to 0.14 - 0.79% incorporation of the precursor. The leading technique employed is described. After completion of the feeding period (7-14 days), more than 99% of the radioactivity originally fed to the plants was still recoverable, the main peak still corresponding to that of the original solution fed. The relatively high incorporation of radioactivity into the N-methyl group is the only significant difference from the labelling pattern obtained with other known precursors of the pyridine ring of nicotine. Implications of results are discussed. Previous findings indicating roots of tobacco plants as the main site of nicotine biosynthesis and leaves as nicotine depon are supported.


Tobacco plants (Nicotiana rustica L. var. brasiliensis) were placed in distilled water. The biosynthesis of nicotine was traced via a precursor, normocotine, by a mechanism involving alkaloid biosynthesis.

II.\-P.\-b CARBAMATES

606 Casida, J.E. MODE OF ACTION OF CARBAMATES. Annu. Rev. Ent. 5 (1963) 33-68.

Review. The various aspects considered by the author are general pharmacology, metabolism and activity, hydrolysis, in vitro and in vivo reaction with esterases, metabolism in mammals, plants, and insects. Studies using radiocarbons are cited, also some unpublished results obtained by H.W. Dorough, N.C. Leeding, J.G. Krishna, and J.E. Casida in administering carbaryl-C\(^4\)-labelled Sevin (1-naphthyl methylcarbamate) to houseflies, rats, and ham and cotton plants.


Dimethylcarbamates have been prepared with carbon-C\(^4\)-labelled and methylcarbamates with methyl carbonyl- and ring-labelling utilizing carbon-14. The pharmacological action of these compounds presumably results from acetylcholinesterase inhibition and may involve carbamylation. Reaction of carbamyl-methyl labelled carbanates with purified cholinesterase or other esterases would allow a critical examination of this carbamylaction reaction and the cause of spontaneous and the cause of spontaneous and induced reactivation or deactivation. The physiological significance of cholinesterase inhibition might be examined by administering acetyl-C\(^4\)-choline and analysis for radioactivity by acetylcholine accumulation in nervous tissue, or by utilizing acetyl-C\(^4\)-choline as the substrate for in vitro determination of the degree of cholinesterase inhibition in tissues of poisoned animals with minimal dilution of the inhibitors and enzymes during analysis. Some progress has been made with radiolabelled materials in investigating the metabolism of carbanate insecticides. Sevin (1-naphthyl methylcarbamate) has been more extensively studied along with its potential hydrolysis products. The assumption that the metabolism of Sevin involves an initial hydrolysis and then further decomposition of the fragments was not supported by carbon-14 studies. The major detoxification mechanism in mammals, and probably also in insects, results from initial oxidative attack on the carbamate by the microsomes in the presence of reduced nicotinamide-adenine dinucleotide phosphate. Sevin is readily metabolized in mammals, but the fate of the majority of the fragments has not been resolved. Some of the metabolites appear in the milk of lactating animals. One step in the metabolism appears to be formation of the N-methyl derivative. Preliminary studies on the metabolism of radiolabelled Dimethionin (2,3-dimethoxy-carbamyl-3,4-methylpyruvyl-3,4-diisopropylcarbamate) and a related compound in cockroaches also indicate that oxidative attack forms N-methyl-N-methylcarbamate-derivatives.

(Foot note)


The metabolism of carbanate insecticides will be intensively investigated using C\(^4\)-labelled materials. Dimethylcarbamates labelled in the carbonyl grouping and N-methylcarbamates labelled in the carbonyl, methyl and aromatic groups will carbamate, dimethylcarbamates, and the N phenyl, 4-methylthio-3,5-xylene to be considered include residual in materials, enzymatic and metabolic synergists.

609 Dorough, H.W., Castida, J.E. Bull. Ent. Soc. Amer. 9, 3 (1962)

The metabolism of C\(^4\)-tagged S, N metabolites, S of which were metabolites were absent in plant.

610 Dorough, H.W., Leeding, N.C. N-METHYLICARBAZATE INSECTICIDE C\(^4\)-labelled Sevin was used. Se microsomes and insects (Musca \( \delta \) and insects metabolizing modifying p.33 associated with milk with Sevin were made by liver microsomes, insec.

611 Eldefrawi, M.E., Huskins, W.M. THE TOXICITY OF SEVIN TO T Sevin (1-naphthyl N-methylcarbamic acid, Sevin) was used to examine Sevin. Insects penetrating within 6 h. It is not the LD\(_{50} \text{S} \geq 2 \text{mg/} \text{kg}. \text{Resistant:}


The increasing interest in m-metabolic synthesis procedure is reported (1964). The N-methylcarbamate 3734 (4-methylthio-3,5-xylene) and sodium acetate were reacted to phenol. A two-compartment rat remotely 54 to 95%. Chromatographic micrographs are reported.

613 Leeding, N.C., Krishna, I.G. Bull. Ent. Soc. Amer. 9, 3 (1962)

Administration of Sevin-C\(^4\) to m of hydroxylated metabolites with to examine the nature of these covalent.
methyl and aromatic groups will be considered. Compounds to be examined will include the dimethylcarbamates, dimetila, and the N-methylcarbamates of 1-naphthyl, p-isopropoxyphenyl, m-isopropoxyphenol, 4-methylthio-3,5-xylene and 4-dimethylamino-3,5-xylene. Characteristics of the compounds to be considered include residual persistence and fume in plants, metabolic pathway and rate of detoxication in mammals, enzymatic mechanisms of resistance and the mode of action of synergists.

509 Dorrough, H.W., Castida, J.E. NON-HYDROLYTIC PATHWAY IN METABOLISM OF SEVIN. (Abstr. 82). Bull. ent. Soc. Amer. 8, 3 (1963) 189.

The metabolism of C14-labeled Sevin by rat liver microsomes, insects, and plants was examined. At least 3 metabolites, 2 of which were carboxamides, were formed by the microsomes and insects. Most of these metabolites were absent in plants. The nature of the products will be discussed.


C4-labelled Sevin was used. Sevin (1-naphthyl N-methylcarbamate), when metabolized by rat liver microsomes and insects (Musca domestica L. and Periplaneta americana (L.)) yielded at least 5 carboxamides involving modifications of both the methyl group and ring. Certain of these metabolites appeared in urines when Sevin was fed to a goat. The metabolism of p-isopropoxyphenyl N-methylcarbamate by liver microsomes, insects and plants was compared to that of Sevin.


Sevin(14C) (1-naphthyl N-methylcarbamate) labelled with C14 has been used on three insect species by topical application to acetone. Sevin is absorbed rapidly into two house flies (Musca domestica L.). 75% of a dose penetrating within 4 h. It is rapidly metabolized and excreted, so that toxicity is low as shown by the LD50 = 2.6 mg/g. Resistant house flies differ from susceptible ones only in greater metabolism and consequent lower mortality. If metabolism is prevented by addition of a synergist such as resorcin, the toxicity of Sevin is increased up to 50-fold, and much of the absorbed Sevin remains in the body unchanged. The critical step is the hydrolysis of Sevin to 1-naphthyl and methyl amine, which is controlled by a carboxylate esterase enzyme. When this is inhibited, toxicity is low. Sevin penetrates more slowly into the large milkweed bug (Dleonis fasciatus (Dallas), e.g. 40% of an applied dose enters in 9 hours. It is metabolized and excreted very slowly so that LD50 is low. The German cockroach (Blattella germanica (L.)) absorbed Sevin slowly and metabolized it rapidly. This results in low toxicity: LD50 = 20 mg/g.


The increasing interest in N-methylcarbamates as insecticides prompted their radiolabelling. A convenient radiosynthesis procedure is reported for Sevin (1-naphthyl N-methylcarbamate), heculec 2727 (Union Carbide 10864), the N-methylcarbamates of methyl isopropyl phenol, naphthyl isopropyl phenol, and Zecran (4-dimethylamino-3,5-xylene). Acetate-C14 chloride and sodium aze ate were reacted to yield methyl isocyanate-C14 which was then reacted with the appropriate phenol. A two-compartment reaction tube with a break-seal was utilized. Yields on 0.5 mol scale were nearly 60 to 70%. Chromatographic procedures for isolating the N-methyl carboxamides from their reaction mixtures are reported.


Administration of Sevin-C14 to rats resulted in excretion of about 2/3 of the dose in the urine as conjugates of hydroxylated metabolites with the carboxyl group intact. Enzymatic preparations of rat liver were used to examine the nature of these conjugation systems. Evidence for hydroxylated metabolites of Sevin was found.

175
II-F  e  ARSENIC


In order to obtain As$^{36}$ of high purity and specific activity as a tracer or for other purposes, chemically pure (99.999999%) Ge and (99.994%) GeO$_2$ were irradiated in the Q6 cyclotron with protons from 10 to 14 MeV. The irradiated target consisted of As$^{75}$, As$^{77}$, As$^{78}$ and As$^{79}$, and, as well as Ge$^{71}$ and Ge$^{72}$, and for production of Ge$^{74}$ and Ge$^{75}$ with small amounts of Ga$^{69}$ and Ga$^{73}$. At a current density of 10 $\mu$A and a duration of 6 h, the total radioactivity was of the order of several 10s nuc, and the amount of As$^{36}$ appeared to be 1 nuc or less. The irradiated target was dissolved in aqua regia (20 ml) and the GeO$_2$ formed was dissolved until a residue of 1 ml remained. Then the As$_2$O$_3$ was distilled in the presence of 10 N HCl (10 ml) and 8 N HBr (5 ml) in an ice-cooled adapter containing H$_2$O. Although the As recovery was 94%, very little radioactive As was obtained. The distillation was taken up with H$_2$O, reduced with Na and Na$_2$S, and extracted with CCl$_4$ and diethyl-dithio-carbamate. All operations were followed with a $\gamma$-counter. For measuring the conversion electron spectrum, the As was extracted with HNO$_3$, mounted on a trace of celluloid on a thin polyvinyl chloride film lined with a thin layer of vacuum-evaporated Al, dried in vacuo, and measured by $\beta$-spectroscopy. (TID-6613, suppl.1)

II-F  e  SULFUR


In many preparations of S$^{35}$-labelled compounds elemental S is the starting material. Usually S$^{35}$ is obtained by irradiating KCl in a reactor which, according to Cullin(n,2n)$^{35}$S, gives radioactive S. The radioisotope is isolated as H$_2$S$^{35}$O which contains an excess of HCl. A method and an apparatus are described by which a sulphate solution of elemental S of high specific activity can be obtained. (TID-5098, 552)


Sections are included on (1) physical properties and methods of obtaining S$^{35}$; (2) production of preparations containing S$^{35}$; (3) uses of S$^{35}$; and (4) safety techniques to be used when working with S$^{35}$.

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See also:

350 Radioisotopic assay of acetylcholinesterase. (Winteringham and Disney, 1962)

354 Acetylcholinesterase activity and competitive inhibition at low substrate concentrations. (Winteringham and Disney, 1963)

II-G  INSECTICIDE METABOLISM

II-G-1  INSECTS

II-G-1-a  GENERAL


Review article. Enzymatic detoxication reactions considered are conjugation, oxidation, reduction, dehydrochlorination, and deacetylation of heavy metal poisons by reaction with S compounds. Resistance mechanisms to DDT, BHC, Furan, cyclodiene Insecticides, pyrethrin and organophosphate Insecticides are discussed, and a number of studies quoted in which radioisotopes were used.

178

Techniques useful for investigations of radioisotope-labelled insecticides and insect and their application to the study of insect mechanisms of resistance are reviewed. Data are presented on the quantitative fate and metabolism of 32P-labelled Dipteranes, O, O-diethyl 1-hydroxy-9,2,3-trichloromethyl phosphorates, in normal and Dihperane-resistant houseflies. The resistant fly strain was able to detoxify the insecticide and excrete the water-soluble metabolites at a more rapid rate than the normal flies. Metabolites were identified by paper chromatography, and no qualitative differences were found between strains. (Protan anth.)

II - G - 1 - b SIDRIN


The absorption and in vivo metabolism of C14 or 32P-labelled 3-(dimethoxyphosphoryloxy)-N,N-dimethyl-o-crotonamidee (SD-3462) by Heliothis zea (Boisd), boil weevils (Anthonomus grandis Boisdu), and excited cotton leaves were studied through the use of standard radioisotopic techniques.

II - G - 1 - c CYCLODENE


The relatively low toxicities to the adult housefly, Musca domestica L., of the compounds chlorodene (1: hexachloro precursor); 1,2,3,4,5,6-hexachloro-1,4-benzenonaphthalene (II) and its 6,7-double bond isomer (III) are in the order 1 > II > III. Studies by gas chromatography and with C14-labelled compounds have shown that this is also the order of epoxide formation in vivo; chlorodene forms an appreciable amount of a tentatively identified epoxide; II gives a small amount of a similar substance; III does not apparently give an epoxide. All 3 compounds are further converted into more polar substances.

II - G - 1 - d ALDERIN AND DIELDRIN


The metabolism and excretion of alderin and dieldrin in Schistocerca gregaria (Forsk.) were examined quantitatively by means of preparations labelled with C14. Solutions contained 2 μg labelled alderin or dieldrin in 5 μl olive oil (representing about 100 cpm) were injected into the abdomens of 5th instar hoppers. They were subsequently kept at room temperature for 7 d. Any that died during this period and survivors (plus excreta) were preserved under ethanol. This procedure was repeated until enough radioactive solution to provide 40,000 cpm had been injected. The preserved material was homogenised with ethanol and repeatedly extracted with benzene, NBOH and HCI in turn until radioactive material representing 40,000 cpm had been recovered. Aldrin and dieldrin were re-isolated from the concentrated extracts. It was found that both materials were extracted slowly, the age at which alderin was isolated to dieldrin being slower than that recorded for Musca domestica L. (Nature 189 (1961) 25). Dieldrin was extracted unchanged and repeated methanolic doses should therefore exert a cumulative action in locusts.

II - G - 1 - e DDT


Larvae of DDT-resistant and susceptible strains of the yellow-fever mosquito, Anos aegypti (L.), were all susceptible to Dieldrin (a mixture of 1 part of 1,1-bis(p-chlorophenyl)-2-nitropropane (Polid) and 2 parts of 1,1-bis(p-chlorophenyl)-2-nitrobutane (Salan), but the former were resistant to o-chloro-DDT.
and unusually for \( \text{g- \text{chloro-DDT}} \). \text{DDM} was synergistic with \( \text{DDT, \ g- \text{chloro-DDT, and \ f- \text{chloro-DDT}} \) for the resistant strain. Paper chromatography revealed \( \text{DDM} \) as the only metabolite of \( \text{DDT} \), other candidate metabolites and water-soluble derivatives being absent. \( \text{g- \text{chloro-DDT}} \) was detected as the only metabolite of \( \text{g- \text{chloro-DDT}} \). The resistant strain produced more \( \text{DDM} \) and \( \text{g- \text{chloro-DDM}} \) than the susceptible strains, and this production was apparently reduced by \( \text{DDM} \). The following radioactive compounds were used: \( \text{g- \text{chloro-DDT}} \) a) ring-labelled on the para-carbon (activity 3.23 mc/g) b) chain-labelled on the 1-carbon, i.e., 1,1,1-trichloro-2,2-bis(p-chlorophenyl)ethane-1-\( ^{14} \text{C} \), synthesised by J.P. D. (activity 1.78 mc/g) \( \text{DDM} \). Made from ring-labelled \( \text{DDT} \) by refining it with 1% KOH in 95% aqueous ethanol for 1 hr. \( \text{g- \text{chloro-DDT}} \) a) chain-labelled on the 1-carbon (activity 1.38 mc/g) b) chain-labelled on the 2-carbon (activity 1.36 mc/g), both synthesised by J.P. D. \( \text{g- \text{chloro-DDM}} \). Made from the 1-carbon-labelled \( \text{g- \text{chloro-DDT}} \) by refining it with 1% KOH in 95% aqueous ethanol for 30 min.


A Tocoman, Mexico strain of \( \text{Pocicocinthea gynecilla} \) (Saunders) adults was found to be 8 times more resistant to \( \text{DDT} \) at the LD\(_{50}\) level and 18 times more resistant at the LD\(_{50}\) level than moths from El Paso, Texas. The radioactive \( \text{g- \text{chol}-\text{labelled DDT}} \) had a specific activity of 1556 cpm/\( \mu \)g. Adults were treated topically, with 0.5 to 4.5 \( \mu \)g of \( \text{DDT} \). During the first 24 hr after treatment, absorption of \( \text{DDT} \) was slightly more rapid by moths of the El Paso strain. Dehydrochlorination of absorbed \( \text{DDT} \) to \( \text{DDM} \) occurred in adults from both strains, but the dehydrochlorination was much more extensive in individuals from the Mexican strain.

624 Cakamp, L.K., Warten, B.L. DENSITY-MORTALITY RELATIONS IN MOSQUITO BIOASSAYS. (Abstr. 94). Bull. ent. Soc. Amer. 9, 3 (1956) 165.

When \( \text{DDT} \) is tested against Aedes aegypti larvae, the mortality declines with greater densities. Determinations of amounts of \( \text{DDT} \) picked up indicate that less \( \text{DDT} \) is picked up per larva when the density is great. \( \text{g- \text{chol}-\text{labelled DDT}} \) has been used for determination.


Rates of absorption of \( \text{DDT} \) by nymphs and adults were determined following application of \( \text{DDT, \text{C}}^{14} \) in aceone solution to the ventral abdominal regions of the insects. Absorption of \( \text{DDT} \) increased to approximately 60% of the amount applied after 72 hr and remained constant at this level for at least 600 hr. Over 80% of the absorbed \( \text{DDT} \) was either excreted or metabolized in nymphs. Absorption in adults increased almost linearly from 37% of the amount applied at 72 hr to 120 hr at which time all adults were dead. Only 0% of the absorbed \( \text{DDT} \) was metabolized or excreted by adults. Metabolites of \( \text{DDT} \) were detected by measurement of radioactivities from paper chromatograms of extracts of the insects or their faeces. 5 metabolites, of which 4 were unidentified and 1 was identified as \( \text{2,2-bis(p-chlorophenyl)} \)-1,1-dichloro-ethane (I), were detected, but different in quality, composition, and quantity in normal extracts and in faecal extracts of nymphs and adults, and with age. I was the most important metabolite quantity in nymphs: almost 8% of the absorbed radioactivity was found as I in the 72 hr. After 48 hr, the rate of I production in nymphs decreased. Of the metabolites produced by adults, only 1 unidentified compound was accumulated to a significant extent. Higher resistance of nymphs toward \( \text{DDT} \) was attributed, at least in part, to differences in absorption and dehydrochlorination processes. Pathways for the independent production of I and the unidentified metabolites, induced through participation of reduced triphosphopyridine nucleotide, were proposed. (CA 67: 10322k) 9

626 Goss, H.T. FACTORS INVOLVED IN DIFFERENTIAL SUSCEPTIBILITY OF CORN EARWORM LARVAE TO \( \text{DDT} \). J. econ. Ent. 54, 6 (1961) 1269-8.

Full-grown corn earwigs, \( \text{Heliothis zea} \) (Boisd.), require more than 1000 times as much \( \text{DDT} \) on a weight basis as small larvae in order to obtain LD\(_{50}\) values for topical application in aceone. Infected \( \text{DDT} \) in aceone is only slightly less effective on large larvae than on small ones. The non-radioactive \( \text{DDT} \) was chiefly the \( \text{p'-form} \) obtained by \( \text{3 crystallisation} \) of technical material from hot methanol (melting point was 105, 5°C). Radioactive \( \text{DDT} \) was synthesised with \( \text{C}^{14} \) in the p'-position (melting point 104, 5°C after crystallisation). When assayed on internal flow proportional counter the \( \text{DDT} \) gave 25 cpm/\( \mu \)g. Chemical and autoradiographic analysis showed that lack of penetration by \( \text{DDT} \) through the integument of the large larvae was the chief fact. Topically applied material incubated colored larvae indicate that \( \text{DDT} \) black larvae.


The metabolism of \( \text{DDT} \) in the castor of a sample of \( \text{C}^{14} \)-labelled excreta led to the finding of 4 (ethylenyl, 1,1-dichloro-2,2- 3-1.

628 Linscheid, D.A., Baden, J.B. TO SUSCEPTIBLE AND RESISTANT. The metabolism of \( \text{DDT} \) by generally with \( \text{DDT} \) or \( \text{DDT} \) plus is the same treatments. Extracts from some of these treated \( \text{C}^{14} \)-labelled \( \text{DDT} \) indicated the quantity to a compound which treated with toxaphene absorbs

629 Perry, A.S., Miller, S. FOUL CEPTIBLE AND DDT-RESISTANT. Homogenates and acetone pow extracts from the dig, thiglycolic acid, and acetic preparations when incubated w of their neutral or acidic chaps chromatography, the me thymol (DDE). 4, 4-dichlorine fluron demonstration of \( \text{DDT} \).

(Mostly auth.)

630 Iyanagi, K., Salou, T., Kuss OF \( \text{C}^{14} \)-LABELLED DISPOSOPHIL damage. Boye-Kaprayas.

The distribution and metabolites of \( \text{DDT} \) treated with \( \text{C}^{14} \)-labelled \( \text{DDT} \) appeared, and comparatively less. Alcohol-formic acid fractions; soluble phosphorolysed compon may be assumed that only 1/4.

631 Pocob, J.B., Cook, B.J., R. MULTI-RESISTANT Mosca do
of DDT, and p-chloro-DDT. Only metabolites of DDT, other candidate DDE was detected as the only DE and p-chloro-DDT than the same.

The following radioactive compounds (22.72 meq/g) by chloroform: 1-C4, synthesized by DDT by reacting with 2% KOH in the 1-carbon activity 1.32 mcg/g (by 1,5-D, p-Chloro-DDT). KOH in 99% aqueous ethanol for


A was found to be 6 times more the level than those from El Paso, activity of 1.50 mcg/g. Adults after 24 h after treatment, absorption and utilization of labeled DDT to such an extent that DDT-C14 in the mosquito larvae.

IN MOSQUITO BIOASSAY. (Abtta, 9th).

a with greater difficulty. Determine the difference in density of DDT-C14 in Triatoma infestans.

The following application of DDT-C14 in nymphs is increased to a remaining constant at this level for metabolism in nymphs. Absorption 72 h to 120 h at which time all vectors by adults. Metabolites of a number of extracts of the insect species identified as 1,1-bis(p-chlorophenyl) 1,1,1-trichloroethane, composition, and quantity in time. It was the most important was found as in the 1st 24 h, from 15% to 40% of the products produced by adults, only 15% reappearing of nymphs toward the next generation.

Of CORN EARWORM LARVAE TO

000 times as much DDT on a weight basis in eggs, infected DDT in larvae. The non-radioactive DDT was isolated fromRet evolved (evolved)

p" position (eliciting point 106.3°C) from the DDT gave 28 mcg/g. DDT through the ingestion of the larvae was the chief factor causing the increase in LDA50 values. Addition of nonvolatile oils to the topical application material increases the effectiveness of DDT to the larval diet. Tests with different colored larvae indicate that light yellow larvae are approximately twice as susceptible as the dark red or black larvae.


The metabolism of DDT in Blattella germanica (L.) was investigated by means of topical application of a sample of C14-labeled DDT. This technique, combined with chromatography of extracts and extracts led to the finding of 6 metabolites, all more polar in nature than DDT but differing from DDE (ethylene, 1,1-dichloro-2,2-dichloro-(p-chlorophenyl).)


The metabolism of DDT by susceptible and resistant boll weevils (Anthonomus grandis Bodd.) treated topically with DDT or DDT plus toxaphene was studied. Little difference was found between strains receiving the same treatments. Extracts of weevils treated with DDT plus toxaphene contained slightly more DDT than those weevils treated with DDT alone. Poor recovery of the applied DDT was obtained. Tests with C14-labeled DDT indicated that the treated weevils rubbed off much of the toxicant and converted a small quantity to a compound which did not respond to the colorimetric analysis employed. Resistant weevils treated with toxaphene absorbed less than similarly treated susceptible weevils. (Aub.)


Homogenates and acetone powders of both susceptible and DDT-resistant body lice (Pediculus humanus humanus L.) catalyze the degradation of DDT in vitro. Reduced glutathione, cysteine, ascorbic acid, thiglycerol acid, and coenzyme A may be used as cofactors for activation of the enzyme system. Enzyme preparations incubated with DDT under optimum conditions yield at least 3 metabolites. On the basis of their neutral or acidic characters, ultraviolet and infrared absorption spectra, colorimetric analysis, and paper chromatography, the metabolites have been identified as 2,2-bis(p-chlorophenyl)-1,1-dichloroethane (DEE); 4,4-dichloro-2,2-dichloroethylene (DDE); and Ne-p-chlorophenylalanine (PCA) and Ne-p-chlorophenylalanine (PCA).

This is the first demonstration of DDE as a product of DDT metabolism in an insect. C14-labeled DDT was used.

(Mostly auth.)

II - G - 1 - f DPP


The distribution and metabolism of diethoxyfluoridate (I) in the American cockroach topically treated with C14-labeled I were studied. Very small amounts of I were found in the transparent system, and comparatively large amounts were found in the digestive system and Malpighian tubules. Alcohol-formic acid fractionation revealed that about 10% of the total I taken up by the tissues were acid-soluble phosphorylated compounds and others were not incorporated into the acid-soluble compounds. It may be assumed that only 1/10 of the total I taken up by the insect tissues actually inhibits cholinesterases and other enzymes. Metabolites of I were observed in the digestive system and coral vessels. After topically applied I has penetrated into the body of the cockroach, it may be transported to the tissues by the blood system. (From BA 38: 1960, 4032.)

II - G - 1 - g DIAZINON

studies were made in 3 strains (a susceptible, a low-resistant, and a high-resistant) of house flies (Musca domestica L.) to determine whether resistance to diazinon (O,O-dimethyl O-(2-isopropyl)-4-methyl-4
pyridylthio)phosphorothioate), parathion and DDT is attributable to differences in absorption rates. O2-labelled diazinon was used. Processing of samples for O2-counting (extraction, concentration of extracts and counting itself) are described. Penetration studies with diazinon showed less rapid absorption by resistant flies and it was concluded that reduction in permeability of the cuticle is a factor in resistance to diazinon. This is not the only defense mechanism, however, since flies which were 18-fold resistant by topical measurement still showed some tolerance (14-fold) when the insecticide was injected. Similarly, the low-resistant strain (10-fold topical) was 2-fold resistant to injected diazinon. More rapid de
metabolism is precipitated as the additional resistance mechanism, since the susceptibles contained higher amounts of water-soluble metabolites than resistant flies. Resistance to diazinon was higher by oral application than by either injection or topical treatment. All-enteric activity of the strain was inversely proportional to the level of diazinon resistance; this fact confirms previous reports on other O-p resistant house flies. There were only slight differences among the strains in cholesterinesterase level and in sensitivity to in vivo inhibition. In parathion and DDT-resistance, penetration appears not to be an important factor.

II - G - 1 - b DIMETHOATE


O2-labelled dimethoate \(^{\text{a}}\) was absorbed and excreted rapidly by 5th instar bollworm larvae (Heliothis era (Boisdin) and adult boll weevils (Anthonomus grandis Boheman). These insects absorbed 54.7% and 74.3% of topically applied dimethoate, respectively, after 24 h and 70.2% of an injected dose of dimethoate was excreted by bollworm larvae after 24 h. The in vitro metabolism of O2-labelled dimethoate in adult boll weevils, 5th-stage bollworm larvae, and content solutions was characterized qualitatively and quantitatively through the use of paper chromatography, spectroscopy, and standard radioactivity procedures. Dimethoate and its metabolites were detected in various insects and plant extracts. In bollworms, the principal site for hydrolytic cleavage of the dimethoate molecule was the carbonyl-nitrogen bond and the sulfur-carbon bond. The oxygen analogue of dimethoate was formed in both plants and insects but was broken down rapidly by the latter to non-toxic products. (Auth.)

\(^{\text{a}}\) O2-dimethyl \(\text{O}(\text{2-diethylcarbonyl)methyl})\text{phosphorothioate.}

II - G - 1 - c IMIDAN


The metabolic fate of C\(^{14}\)-imidain [p-[(bis(dimethyl-carbonyl)-O-diethyl-phosphorothioate]] was studied in insects in vivo. Purified acetone extracts of whole insect homogenates were examined by means of paper chromatography and radioassay techniques. Results were correlated with the metabolic fate of imidain in plants.

II - G - 1 - d EUDONYMYCIN


A method for microsynthesizing C\(^{14}\)-labelled eudonymycin is described, starting with BaC\(^{14}\)O\(_{3}\). (specific activity 23.5 nCi/mg). The insecticide is broken down into the corresponding 3-hydroxy-carboxylic acids by freshly ground beef liver and Aedes aegypti larvae (5-6 day larvae were left for 20 h, such that 20 \(\mu\)l water were and 250 \(\gamma\) trichlorfon were allowed per 0.5 g larvae). Of the enzymes tested (catalase, peroxidase, glucose oxidase, \(\alpha\)-amylase, and a mixture of hydrolases from Aspergillus niger) none appeared to have any effect on the insecticide.

180
NAPHTHALENE

Atlas, R.O. THE IN VIVO HYDROXYLATION OF NAPHTHALENE-1-C\textsuperscript{14} BY HOUSEFLY MICROSONES. DISS. ABSTR. 34, 6 (1963) 817-8.
Naphthalene-1-C\textsuperscript{14} was utilized for establishing the optimum conditions for the hydroxylation of aromatic hydrocarbons by microsomes isolated from Musca domestica L. Reduced trifluoroacetylated appears to be essential for the hydroxylation reactions. A transient metabolite, possibly an oxepoxide of naphthalene, does not require TPN. The increasing order of naphthalene metabolism by microsomes isolated from 6-\textsuperscript{d}o-old flies was, according to strain: susceptible, diethylresistant, naphthalene-resistant, and DDT-resistant. These differences were found to be insignificant among the first 3 strains when the microsomes were isolated from 12-day-old flies. Chromatographic evidence was presented with shows that the 4 strains produced the same naphthalene metabolites when 6-d-old, but only the susceptible strain exhibited this pattern when the flies were 23-d-old. The oxidative mechanism of the microsomal system was inhibited by SKF 525-A and piperoxyn benzoate. The soluble fraction has been shown to possess the necessary mechanism for the hydroxylation of naphthalene, however, the amount of substrate metabolized was less than with microsomal fractions. Chromatographic evidence indicated that 7 non-volatile metabolites were produced when naphthalene was the substrate and only 5 when 1-naphthol-1-C\textsuperscript{14} was used.

MALATHION

Radiometric and enzymatic techniques were used in studying the metabolism of malathion and malaxon by susceptible and malathion-resistant Culex tarsalis Coq. larvae. Radiometric studies showed malathion-resistant larvae were 5 to 10 times more efficient in degrading malathion than susceptible larvae, both in vivo and in vitro. Malathion was degraded primarily by the formation of carboxylic acid derivatives in larvae of both colonies. In vitro studies showed resistant larval homogenates produced over 11 times more carboxylic acid derivatives than phosphorus derivatives as compared with a 9:1 ratio in susceptible larvae. Enzymatic studies indicated that the relatively small fraction of total malathion converted to malaxon was determined at a much more rapid rate in larvae of the resistant than in larvae of a susceptible strain. The differences noted are of sufficient magnitude to be considered primary factors responsible for the resistance to malathion present. (Ann.)

Degradation of C\textsuperscript{14} malathion was rapid in both susceptible and malathion-resistant house flies. The resistant strain degraded the compound at a rate several times greater than did susceptible flies. The malathion synergist DEF greatly decreased the rate of malathion degradation.


Radioactive malathion was synthesized from \textsuperscript{32}P-phosphoric acid \textsuperscript{32}P-PHOSPHORIC ACID (sec J. econ. Ent. 52 (1961) 1023) and purified. Larvae of the resistant strain of Culex tarsalis Coquillett, on exposure to malathion, come to contain \textsuperscript{32}P as much malathion as normal larvae. This is partly due to a higher phosphatase activity hydrolyzing malathion. But the major difference is in the higher carboxyesterase activity hydrolyzing malathion; this insecticidal difference was demonstrated in vivo by larve clear of gut contents, and in vitro in homogenates and particularly the mitochondria fraction. TPN, a carboxyesterase inhibitor, proved synergistic for malathion against the resistant strain. Increased carboxyesterase content was inseparable genetically from malathion resistance in hybridization experiments, which also indicated the malathion resistance to be due to a single partially dominant gene allele.

Larvae of a malathion-tolerant strain *Aedes aegypti* did not differ from the normal in the activity of phosphatase, carboxypeptidase, or aleuronase. Experiments with 3H-labelled malathion showed 1/13 as much absorption and retention of malathion in larvae of the normal strain. The high cross-resistance shown by this strain to DDT was accompanied by only 1/4 as much absorption and retention of DDT as normal. *C*4-labelled DDT was used (1 ppm).


Using histochemical and autoradiographic techniques the metabolism and mode of action of malathion was investigated in resistant and susceptible strains of the mosquito, *Culex tarsalis* Coq. Relationships between the results of these experiments and levels of resistance will be discussed. (Auth.)


Larvae of a resistant and a susceptible strain were treated with a discriminating dose of 3H-labelled malathion. The larvae were homogenized at various times, up to 24 h, extracted, and the insecticide metabolites identified qualitatively and quantitatively by column and paper chromatography. At the time the water-soluble metabolites were considered as a single group; the chloroform-soluble constituents were further identified as the original malathion and its toxic oxidation product, malaoxon. A similar rate of penetration of malathion into both strains is implied, with similar rates of conversion of malathion to malaoxon, and similar degradation of malaoxon. Hydrolysis of malaoxon however, occurred at twice the rate in the resistant strain as in the susceptible strain. Malaoxon concentrations were found to be not similar in the 2 strains at the time of similar symptoms (LT50). Homogenization of the larvae may have masked the concentration at a vital locus.

643* Puckert, J., Shibideo, T. SELECTIVE TOXICITIES OF ORGANIC PHOSPHORUS INSECTICIDES. III. AN ENZYME SYSTEM INCLUDED IN THE CLEAVAGE OF METHYL PARATHION TO DIMETHYL PARATHION IN THE SUPERNATANT OF SOME TYPES OF HOMOGENATES. *Biochemistry* 22, 3 (1963) 77-81.

The nature of the reaction system from methyl parathion to demethyl parathion was studied in tissues of mammalia (rat, guinea pig, and rabbit) and insects (*Chilo suppressalis*, *Periplaneta americana*, and *Xyela
cupuliformis*). Using 3H-labelled methyl parathion and Mal parathion, the reaction in the supernatant from rat liver homogenate was independent of the presence of coenzyme B1 and was inhibited most effectively by phenylmercury acetate and p-chloromercuribenzenesulphonate. The optimal pH was 6.5-7.5. Addition of reduced glutathione reversed the activity. Anaerobic conditions did not affect the reaction. These results suggested that the reaction requires the presence of a SH-containing enzyme. The highest activity was found in the liver among the organs tested, whatever the species. There was no activity in the blood of larvae of *C. suppressalis* or *X. cupuliformis*. (CA 69: 1964, 15076f).


In an attempt to account for their widely differing susceptibilities to parathion, the uptake and metabolism of 3H-parathion vapor by eggs of the large milkweed bug (*Cicadella viridis* Dall.) and peach tree borer (*Samia cynthia ricini*) (Say) and the uptake by eggs of the Mexican bean beetle (*Epilachna varivestis* Mul.) and southern armyworm (*Spodoptera eridania* Cramer) were investigated. In all cases large losses of parathion were taken up by the chorion and more (30% to 69%) could be washed off with acetone followed by chloroform. Considerable variation was found in ability of the eggs to take up parathion and in penetration of the chorion by the parathion. In the oviposited susceptible peach tree borer and the non-susceptible milkweed bug conversion of internal parathion to paraoxon was 80% and 15%, respectively, suggesting that activation and demethylation did not account for the insensitivity of the milkweed bug. In the other three species there was within broad limits a general relationship between internal levels of parathion and oviposited susceptibility. No single factor could be cited to account for the variations in oviposited susceptibility of the various species to parathion. (Auth.)

645* Flagg, F.W., Jr., Darow, E. NORMAL AND PARATHION BIOCHEMISTRY. The absorption, detoxication susceptible and parathion resistant in the rate of absorption of malathion, and bioethanol, differences in the rate of oxidation of malathion to malaoxon. (Auth.)

646 Schindl, G., Weitmann, E. INSECTICIDES WITH THERMOCHEMICAL ACTIVITY. Toxicological studies were *G*-parathion-methyl phosphorothioate by larvae of Anopheles queenslandicus, the ovaries also were determined. Results in concentration required to kill insects. For example, dichloromethane 0.004 g/16 larvae whereas 1 amount of insecticide found small percentage of the toxic and with Bayer 2340. 3.2% were determined. (Auth.)

647* Becker, H., Müller, P. KLÄRUNG DER INSEKTEN AUSSEN. DURCH MARKIERUNG MIT 14C-VALEROL. (Final report on carried out for the firm Dr. Hummel, Frankfurt am Main.) Neurontin transmitted chloroform transmission separated pow. *HNO*3 it was possible to prepare with radioactive also described, together with the yield. Fly analyses were only not given any water or only 20% (5-15/100) flies was given. Discrepancies in results in the procedure. 1% larger number of flies to be adsorbed or contaminating;
from the normal in the activity of labelled malathion slowed 1/12 as in strain. The high rates resistance absorption and retention of DDT as


and mode of action of malathion was perusal. Coq. Relationships between (Auth.)

A RESISTANT AND A SUSCEPTIBLE PESTICIDE OF ORGANIC SOLUBLE

articularizing dose of P-labelled 1,1,1-trichloroethane, and the insecticide 1 paper chromatography. At the time chloroform-soluble constituents were detected, malathion. A similar rate of conversion of malathion to paraoxon however, occurred at twice concentrations were found to be not progressing the larvae may have

II-1-1-0 R 8700

paration was studied in tissues of Periplaneta americana, and a paraoxon. The reaction in the presence of coenzyme II and was inhibited. The optimal pH was 8.5-9.5. Chloroform did not affect the reaction. Dithiocarbamate containing enzyme. The highest activity was found in the 3rd instar. There was no activity in (1982, 267784)

PARATHION BY INSECT EGGS.

paration, the uptake and metabolism of paraoxon (DAP), and peach tree bean beetle (Epilachna varivestis) instigated. In all cases large amounts of DAP were washed off with aceton followed from plants to take up paraoxon and in a peach tree bean box and the normal was 20% and 24%, respectively, insensitivity of the milkweed bug. In multiple between internal levels of DAP to account for the variations in oviposition.

The absorption, detoxification, and excretion of (P-labelled) paraoxon and paraoxon were studied in susceptible and paraoxon-resistant strains of Musca domestica L. by radiometric techniques. No differences in the rate of absorption of the toxics were noted between susceptible and resistant flies. Both insecticides were rapidly detoxified by the flies in vivo, the metabolism being more rapid in the resistant strain. Differences in the rate of excretion of parathion and/or its metabolites were not great, but paraoxon and/or its metabolites were excreted much more rapidly by flies of the resistant strain. (Food ent.)

Toxicological studies were undertaken with radioactive-labelled paraoxon, Bayvar 2400 (O,O-diethyl C(o-phenyl). C(4-phthalimidophenoxy)phosphorothioate), and dimethoxynitro in the dosage of these toxicants absorbed by larvae of Aedes aquasalis aquasalis Say., Aedes agypti (L.), and Aedes taeniorhynchus (Wied.). The intramuscular injection of the dosage absorbed, the concentration, the time of exposure, and the mortality were also determined. Results indicated that the efficiency of uptake differed with the insecticide used. The concentration required to kill larvae did not necessarily reflect the amount of insecticide that entered the insect. For example, the dose in 24-h exposure tests gave an LC50 of 4.9 ppm and an LD50 of 0.0040 µg/larvae whereas Bayvar 2400 gave an LC50 of 0.003 ppm and an LD50 of 0.0005 µg/larvae. The amount of insecticide found in larvae after 24 h of exposure at the LC50 concentration was only a very small percentage of the total to which they were exposed. Dimethoxynitro, 0.25% with paraoxon, 0.7% and with Bayvar 2400, 2.5% better methods of treatment could make some inferior toxicants into effective larvicides and should increase the efficiency of all toxicants. All three insecticides were excreted readily by larvae. (Aeth.)

II-1-1-0 R 8700

Bucher, H., Müller, P., Forster, H. ABSELSCHLUSSEBERICHÜBER EINENNEUERUNTERSUCHUNG ZUR AUF-klärung DES INSEKTENSTOFFWECHSELS EINES ZUM PATENT ANGEHÖRIGEN INSEKTIZIDES (R 8700) DURCH MARKIERUNG MIT RADIOAKTIVEN ETOKYNS FÜR DIE FIRMAC EMBUSCHEMIE AG., ÖBERHAUSEN-HÖLSEN, (Final report on an investigation into the metabolism of insecticide R 8700, patent applied for, carried out for the firm Rheschtle AG., ÖBERHAUSEN-HÖLSEN, by means of radioisotopes), Beristle Institut e.V., Frankfurt am Main, 9 May 1956. 10p. (In German).
Neutron-irradiated chloroform was mixed with 400 cc of 1% HNO3 and the CI- ions resulting from the degradation separated out. A carrier substance in the form of NaCl was added, and on solidifying with NH4OH, it was possible to precipitate CI- together with the excess of AgNO3 solution as AgCl. Contamination with radioactive phosphorus was avoided. Further steps in the synthesis of CI-labelled R 8700 are described, together with the apparatus used. Storage of time did not permit any precise determination of yield. Fly larvae were carried out with CI-8 R 8700 dissolved in CCl4, subsequently evaporated. Flies were not given any water or sugar for 2 h before the test, and were exposed to the insecticide for 60 min. Only 1.9% (R-8-20) flies were dead, the others were unanesthesized with CH2 and analyzed. The technique is given. Interference in distribution data (for head, legs, thorax, wings, and remains) point to weakness in the procedure. The desirability of a series of tests with CI-8 R 8700 is stressed, which would allow larger numbers of flies to be tested and also permit better differentiation between absorbed and externally adsorbed or contaminating materials. (c)

II-1-1-0 RONNEL

The role of the alimentary tract of the Madeira cockroach, Lemnophora modacea (P.), In the in vivo processes of absorption, transport, metabolism, and excretion of P-labelled (O-Dimethyl C(5-chlorophenoxy)phosphorothioate) was investigated together with the qualitative and quantitative nature of the phosphorus-containing metabolites eliminated. The wall of the foregut was found to be permeable to orally injected ronnel but not to certain of its water soluble hydrolyzate products while the hindgut was
permeable to both. The mi... of the insecticides, may be the most

11. II• G-1• q RUZLEVNE


The absorption and metabolism of $^{38}$O-labeled RUZLEVNE (6-C-2-chloro-4-chlorophenyl-2-methyl-1,2-dimethylbenzimidazole) was studied in 16 species of arthropods. The house fly, Musca domestica L.; stable fly, Stomoxys calcitrans (L.); yellow mealworm, Tenebrio molitor L.; and American cockroach, Periplaneta americana (L.), absorbed greater than 90% of the topically applied dose by 94 hr after treatment. whereas the blow fly, Calliphora vicina (Beemian); Gulf Coast tick, Amblyomma maculatum Koch; and brown dog tick, Dermoophilus annuens (Latreille), absorbed less than 50% of the applied dose. The following insects were also tested: horn fly, Haematobia irritans (L.), German cockroach, Blattella germanica (L.), imported cabbage worm, Pieris rapae (L.), larvac cabbage worm, Hellula vulgaris (Hull), ear worm, Helicoverpa zea (L.); larvae, corn earworm, Heliothis zea (Soddie); larvae, rice weevil, Sitophilus oryzae (L.), adult cadetle, Tenebroides mauritianus (L.) Mexican bean beetle, Epilachna varivestis Mulss. adult bed bug, Cimex lectularius L., adult cotton stainer, Dendroctonus sierrae (Herrich-Schaffer), adult and loosely bee, Apis mellifera L. In general, adult Dicerca degraded RUZLEVNE more completely than Lepidopteran larvae, adult Coleoptera, or adult Hemiptera. Most of the radioactivity in the antracetic extracts of insects had the same $^{38}$O as RUZLEVNE. The metabolism of RUZLEVNE by insects and ticks was less complex than in mammals. Selectivity was probably a function of absorption and detoxification rates in naturally tolerant and in susceptible arthropod species.

11. II• G-1• i SCHRADAN


Schradan has low toxicity for chewing insects (Chilo suppersalis Walker larvae, Periplaneta americana L. adult, Musca domestica vicina Macq., adult), while being highly toxic to sucking insects (e.g., Lepidoptera varicolora Fabricius, Scrophophora lurida Bormeuser, Nephrotoma cinctipes cinctipes Borm.). The absorption, excretion, and metabolism rates of $^{38}$O-schradan in these insects varied considerably. No definitive relationships were found between these factors and toxicities, nor between susceptibility of chitinrecognized to coenzyme A and toxicities, nor between susceptibility of coenzyme A to coenzyme A and toxicities. The absorption of schradan was important to be due to differences in schradan-distribution patterns in insect bodies. The distribution of schradan in insects and the pathways of the insecticides, may be the most

653 Cox, H.C., Bowman, M.C. SCREBBEDIS (Abstr. 80). Bull. Following exposure, different karyotypes of C4-labeled Tetrachor organs and lipid content of full

654 Hamilton, E.W. METABOLISM americana (L.). Bull. Data on the conversion of aldrin selected nontoxic and an ene obtained. Two metabolites of bolite (K). Provisional ielins containing the material) with a solubility at 0.75 μ on their film of absorptance. The difference... The insecticide C4 aldrin standard solution, and in significant amount of 10 in p. but not in mixtures containing C4. Therefore, the methylated brine ketone molecule. Another test in vivo data showed that lambda and arcosin released in the course


Two microorganisms of C4-labeled chloro-4,7-endochloroethylene-4,7 (specific activity 10.8 μCi/mg) 80% effective relative to the labelled he given in CA 56: 1963, 6771a. concentration of 10 ppm 1-3-C

656 Barnes, W.W. THE PENTENA. Bull. Ent. Soc. Amer. 5 (1)

Female $^{3}$, domesticl of reser.

Rate of penetration and metabolism rate and antibiotic properties.

See also:

53 Some results of the use (307 A new DDT-metabolite (308 Radiometric assay of act (309 Acrysteoholotheenice) act (310 Lighths of DDT-resistant
toxicants in insects and the character of the nerve sheath, which acts as a barrier against the penetration of toxicants, may be the most important factors responsible for the selective toxicity observed.

II-1-G-1-1 TELODRIN


Following exposure, different larvae were analyzed by gas-liquid chromatography and by paper chromatography of C-14-labelled Telodrin. Data were obtained on toxicant content in the integument and internal organs and lipid content of full-grown larvae.


Data on the conversion of aldin to dieldrin and other aldin metabolites, in vivo, and the effect of the selected nucleotides and an enzyme, pseudocholinesterase, on the epoxidation of aldin, in vitro, were obtained. Two metabolites of aldin were detected in the cockroach extracts: dieldrin and a ketone (metabolite E). Provisional identification of metabolite K (as extracted from sections of paper chromatograms containing the material) with a pure, synthetic dieldrin ketone was shown by a common band of absorption at 5.72 μ on their infrared spectra. Cyclopentane, a 5-carbon ring ketone, shows the same band of absorptions. The difference in λ, values for metabolite K and dieldrin, however, points to a possible difference in the number and placement of the chlorine atoms. The formation of an isomeric chloride is indicated by apparent dechlorination of aldin and its metabolites in the cockroach (as shown by difference in conversion detected with C-14 and C-labeled aldin); the presence of a product III in C-14-labeled aldin standard solution, and its absence in C-14-labeled aldin standard solutions; and the formation of significant amounts of III in peroxidase and/or DPN+ extraction mixtures containing C-14-labeled aldin, but not in mixtures containing C-14-labeled aldin. The methylketone bridge chlorines are especially labile. Therefore, the methylketone bridge could be one of the reactive sites on the aldin, dieldrin, or dieldrin ketone molecule. Another reactive site is the double bond where the epoxide or ketone is formed. The in vitro data showed that inactivation mixtures containing peroxidase and/or DPN+, reach digestive tract, and aldin resulted in the conversion of significant amounts of aldin to dieldrin.


Two microsyntheses of C-14 labelled Telodrin (isotope R 6709 C-14-CH-1.3-endo 4, 5, 6, 7, 10, 10-octahydrophenyl-4-methylphenyl-4, 5, 6, 7, 10, 10-octahydrophenyl) are described in detail. Starting with 3,4,5,6,7,8,9,10-octahydroxybenzene the chlorinated ring was marked; details are given in CA 58: 1963, 6777E. Larvae of Aedes aegypti absorbed Telodrin-3-C-14 only very slightly; at a concentration of 10 ppm 2.8-C-14 was absorbed to an extent of 1% and converted to 50% VIII (see CA).

II-1-G-1-1 THIODAN


Female M. domestica of resistant and susceptible strains were treated topically with C-14-tagged Thiodan. Rate of penetration and metabolic fate of the insecticide was determined via gas and paper chromatography and autoradiograms. The results indicate varied isomeric penetration and metabolism.

See also:

60 Some results of the use of trace techniques in the study of plant protection. (Andrew et al., 1966)
597 A new DDT-metabolizing enzyme in the German cockroach. (Agost et al., 1965)
304 Radiometric assay of acetylcholinesterase. (Winteringham and Dinsay, 1965)
204 Acetylcholinesterase activity and competitive inhibition at low substrate concentrations. (Winteringham and Dinsay, 1963)
386 Lipids of DDT-resistant and susceptible larvae of Aedes aegypti. (Paul and Brown, 1962)
412 Radiotracer techniques in insect biochemistry. (Winteringham, 1963)
413 The relation between physical properties and penetration of insecticides into cockroach cuticle. (Chesnut & O'Brien, 1965)
414 A new bioassay technique, with special reference to the specific bioassay of DDVP insecticide. (Sun & Johnson, 1965)
415 The action of fungicides on insects. II. The effect of hydrogen cyanide on the activity and respiration of certain insects. (Brown, 1965)
416 The metabolism of neptunium by house fly micrococci and its inhibition by insecticide synergists. (Schoenfeld & Terrell, 1963)
417 Drywood termite metabolism of Vikane fungitox as shown by labeled pool technique. (McKie et al., 1963)
418 Physiology and biochemistry of resistance to chlorinated hydrocarbons. (Kishino, 1965)
419 Insecticides in metabolism. II. Metabolism of C14-labeled aldrin and C14-labeled diethyl in microorganisms, liver homogenates and mosquito larvae. (Koret et al., 1965)
420 Syntheses and studies on some C14-labeled insecticides belonging to the halogenated hydrocarbons and on labeled bromanil. (Koret et al., 1965)
421 Field studies on the effect of dilution of insecticides in rough films. (Purvis, 1961)
422 Microorganisms of C14-labeled insecticides and some biological studies. (Schmieder, 1965)
423 Relation between structure, metabolism and toxicity of the 'cytocides' insecticides. (Brodie & Harrison, 1961)
424 Penetration of BHC insecticides through cuticle of the American cockroach. (Pakami et al., 1961)
425 Fate of C14-labeled p-chlorophenyl p-chlorobenzencesulfonate in some organisms. (Tomilawa, 1960)
426 The metabolism of C14-labeled DDT in the larvae, pupae, and adults of Drosophila melanogaster. (Mann et al., 1961)
427 Further investigations into the mechanism of action of the insecticide Thiodan (4). (Glowsky, 1962)
428 Problems of application and action of Thiodan studied with C14-labeled insecticide. (Glowewald et al., 1962)
429 Biological and chemical properties of dimethane and related derivatives. (Broyd & Arthur, 1968)
430 Reaction of certain phenoxyacetamide insecticides with alcohols and potentiation by breakdown products. (Caruso & Sabatino, 1969)
431 Experiments on the control of some species of plant insects. (Pietrzyk, 1961)
432 The metabolism of parathion in mammals and insects. (Stetsky, 1968)
433 Distribution of orally applied malathion-3H in a forest ecosystem. (Giles & Pankrat, 1963)
434 The effect of SKF 525A (2-diethylaminomethyl 2,9-diphenylalkyl hydrochloride) on organophosphate metabolism in insects and mammals. (Cohen, 1961)
435 Studies on the quantitative uptake of C14-labeled schradan by adults of Dysdercus leonini from insecticidal films. (Ryman & Sadler, 1968)
436 Studies on the mode of action of organophosphate compounds. Part I. Metabolic fate of C14-labeled sumithion and methyl parathion in guinea pig and white rat. (Miyamoto et al., 1963)
437 Studies on the mode of action of organophosphate compounds. Part I. Metabolic fate of C14-labeled sumithion and methyl parathion in guinea pig and white rat. (Miyamoto et al., 1968)
438 Synthetic action of two trioxadifen insecticides and some biological studies. (Akiyama, 1961)
439 Penetration of pyrethrin I labelled with carbon-14 into susceptible and pyrethrin resistant houseflies. (Fitz et al., 1968)
440 Non-hydrolytic pathway in metabolism of Sevin. (Dornish & Caruso, 1962)
441 Non-hydrolytic pathway in metabolism of N-methylcarbamate insecticide. (Dornish, 1963)
442 Relation of the rate of penetration and metabolism to the toxicity of sevin to three insect species. (Gleed & Kneale, 1961)
443 Selective toxicities of organofluorine insecticides. III. An enzyme system included in the cleavage of methyl parathion to demethyl parathion in the supernatant of some types of homogenates. (Pakami & Kishino, 1964)
444 Metabolism of Q 3-dimethyl-6-(methylthio)-m-tolyl phosphorothioate by white rats. (Brady & Arthur, 1969)
445 Absorption and metabolism of Bayer 22408 by dairy cows and residues in the milk. (Buttram & Arthur, 1961)
446 The relation between toxicity and metabolism of parathion in the frog, mouse and cockroach. (Purvis & Cipri, 1961)
447 Studies on the translocation of radioactive schradan in plants and its uptake from film by insects. (Chambers & P., 1961)
448 Some applications of radioisotopes to the study of the contamination of insects by insecticide solutions. (Lewis, 1962)
II - 0 - 2 INSECTICIDE METABOLISM IN ANIMALS OTHER THAN INSECTS

II - G - 2 - a GENERAL


Review article, with 163 references. Typical biochemical mechanisms are discussed, with specific systemic and non-systemic organophosphate insecticides as illustrations. Organophosphates undergo several activation and detoxication processes in insects and mammals. Detoxication mechanisms of organophosphates include destructive hydrolysis at the P-O-C, P-S-C, P-G, P-N, or P-O-N bonds. Other hydrolytic processes occur at groups not linked to the phosphorus atom. It is stressed that insecticide metabolism studies are made in understanding the selective toxicity of insecticides, resistance mechanism, residue problems, and mode-of-action concepts.


The paper gives details on the rates at which DDT-C14, polychlorinated-C14 and chloroaceto-14 are absorbed through the skin, accumulated in the organs and tissues and eliminated from the organisms of farm and laboratory animals. Under the experimental conditions described, the DDT retained by the (cow) organism 8 months after spraying was deposited in all organs, and ultimately in faeces. Polychlorophenol undergoes rapid degradation and is eliminated in the form of decomposition products. A P32-labelled methyl chlorophenol preparation of specific activity 500 mCi was also used. When applied externally, chlorophenol was detected in the blood within minutes (maximum after 30 min). By the 6th and 7th day, none could be detected in milk. After per os administration of chlorophenol to rabbits, chlorophenol could be identified in urine and liver extracts.


A summary is presented of research work on the metabolism of radio-labelled systemic insecticides in animals, with details on experimental procedures and important results. Analyses of samples of blood, urine, faeces and milk are made by various methods in order to trace the fate of an insecticide or its active residue in an animal. Results are cited for numerous insecticides. Studies are also included in which radioisotopes are used to aid research in the mode of action of insecticides and metabolites, metabolism of insect repellents, and insecticide-resistance problems. (Auth.)

II - G - 2 - b ALDRIN AND DIELDRIN


Following intravenous injection of aldrin-C14 and dieldrin-C14, large quantities of a hydrophobic metabolite could be traced in the excretions. By paper chromatography this metabolite was separated into 2 components. The distribution, elimination and metabolism of aldrin-C14 were determined for the rat as follows:
(1) In the organs studied (brain, heart, spleen, testis, kidney, lung, and blood), 0.08-0.09% of the injected dose could be recovered, with diethylcarbodiimide 80-90%. The hydrophilic product occurred in all the organs (lung 35%, kidney 55%), rather less in the rest. Aldrin was found in small quantities in all organs (excepting brain and duodenum). (2) Within 48 h, 18% of the injected dose was excreted, metabolized to the hydrophilic product accounting for up to 95%. (3) Only 20% of the injected dose was stored in fat. Although aldrin is predominant, the hydrophobic product occurs also in abdominal fat. When diethylcarbodiimide is injected intravenously, the same hydrophilic product can be separated as after aldrin-C<sub>3</sub>. Experiments in vivo have shown that blood and duodenal secretion are capable of converting 60-65% of aldrin to diethylcarbodiimide whereas the diethylcarbodiimide itself undergoes no change. In rats, 25% of the injected aldrin-C<sub>3</sub> is eliminated in the faeces within 3 weeks. The hydrophilic product was also isolated from rabbit and separated into 2 components. One of these was identified, following hydrolysis, as the 5,7-dihydroxy-1,4-cineole-5,8-ene-dimethine-1,4,4a,5,6,7,8,8a-octahydroindolophenanthrene. The second predominant component was isolated an oily, yellow product. The mole weight is between 438 and 444. Diethylcarbodiimide was also isolated in crystalline form and identified.

II - G - 2 - c BAYER 23408


The insecticide was labelled with <sup>14</sup>C at dimethyl group of 4-(methylthio)-<i>m</i>-tolyl phosphorothioate (Bayer 23408) was oxidized by rat at the phosphorus methyl and the thiophenyl group: the sulfone and sulfoxide derivatives of the parent material and its oxygen analogues were isolated and identified. Oxidation rather than isomerization was the predominant activation process. Hydrolysis occurred primarily at the P-O-phenyl bond; cleavage of the P-O-methyl bond was not demonstrated. The percentage of hydrolytic products in the urine decreased as the number of doses increased (10 mg/kg/day for 10 d). The simultaneous increase of the blood and brain of rat was inhibited rapidly and recovered slowly. The accumulative-soluble residues in the liver, kidney, muscle, skin, and heart were negligible at 3 d following oral (100 mg/kg) or intraperitoneal treatment of rats. About 80% of the administered Bayer 23408 equivalents was eliminated in the excreta regardless of the route of administration. The absorption and stability of Bayer 23408 in the three species, <i>Musca domestica</i>, <i>Biataia germanica</i> and <i>Antennophora grandis</i>, is tabulated. The non-hydronized radioactive materials were largely unchanged Bayer 23408 but the insects were capable of oxidizing the thiophosphates and thioisobutyl groups to form the possible oxidation products of the parent material. The proportion of each radioactive metabolite was quite variable with the species. Metabolism in cotton plants was also investigated.

<sup>1</sup> Bayer 23408

II - G - 3 - d BAYER 23408


<sup>2</sup>P<sup>3</sup>-labelled Bayer 23408 (O-diethyl O-naphthylmethyl phosphorothioate) was applied dermally at a 0.5% emulsion to two Holstein dairy cows. Detergent quantities of the intact insecticide were isolated from the milk the first 6 days after treatment. Bayer 23408 equivalents in the milk were about 10 times higher than the actual Bayer 23408. No oxygen analog of the parent compound was isolated from milk, but it was the predominant metabolite of the feces. The faecal metabolites were toxic to stable fly (Stomoxys calcitrans (L.)) larvae, but not to house fly (Musca domestica L.) larvae. (Auth.)


<sup>3</sup>P<sup>3</sup>-labelled Bayer 23408 (O-diethyl O-naphthylmethyl phosphorothioate) was applied dermally and orally to steers at 12 mg/kg and subcutaneously to guinea pigs at levels of 95 and 117 mg/kg respectively. The compound was poorly absorbed through the skin following dermal treatment of a steer. In guinea pigs, <sup>31</sup>P<sup>3</sup>-labelled Bayer 23408 was eliminated at a faster rate than in the orally treated steers, and its principal excretory route was through the urine rather than the feces. In steers, the principal metabolite in the urine 2 d after treatment was diethylcarbodiimide treated guinea pigs w steers and guinea pigs at 1 solvent. Chromatograph slowly converted to the or proved to be inactive as on its lack of absorption as isolation as a control, voided. (Auth.)

Karama, W., Rottig, J., γ-BENZENE HEXACHLORIDE. The fate of C<sub>3</sub>-<sup>14</sup>C in male albino rats at 40-50 mg/g producing paper chromatograms 35 and 90% of the was a I and II were apparently stored unchanged. The re- radiographie studies of the central nervous system, <i>B. thuringiensis</i> colony grown in faeces. About nated faster than I. The e

Mellings, H.D., K. A. SYNTHESIS AND RELEASE. The effect of administering lipids was determined. The 1-C<sub>3</sub>-<sup>14</sup>C was injected, labelled panelled to control animals, control rat than a 1-<sup>14</sup>C was greater &<sup>14</sup>C) glyceroles caused by C<sub>3</sub>- lipids; from liver to plasma. (CA)


<sup>2</sup>P<sup>3</sup>-labelled Bayer 23408 (<sup>14</sup>C) radioactivity partitioned in and metabolism of the German mealworm is explained by its insect and mice showed a 0.007 activity to mice, to observed in mice. Similar activities of insect homologs

<sup>2</sup> O-Diethyl O-S-alkyl
after treatment was diethyl phosphoric acid, whereas the main hydrolysis product in 2nd day samples after treatment of guinea pigs was diethylidiphosphoric acid. Of the total radioactivity in faeces from both steers and guinea pigs at 1 to 5 d post-treatment, significant portions were extractable into organic solvents. Chromatographic analysis of these extracts revealed that the major portion of Bayre 23408 was slowly converted to the oxygen analog, Bayre 23408 (O-α-dimethyl-O-naphthalimido phosphate). Bayre 23408 proved to be ineffective as a practical systemic against several important livestock pests, but information on its lack of absorption and stability as determined by the radioscopine technique aided in its further evaluation as a contact, residual insecticide. (From auth.)


The fate of C14- or C14-labelled α- (I) or γ-zenehexachloride (II) after intraperitoneal administration to male albino rats at 40-200 mg/kg as a 2% solution in rape-seed oil, was studied after separation by ascending paper chromatography of extracts of the organs of sacrificed animals and of the excreta. About 40% and 20% of the II was absorbed by the body within 24 h, respectively. About 75% of the absorbed I and II were apparently uniformly distributed in fat depots, skin, and muscle tissues, in which they were stored unchanged. The residual I and II were present mainly in liver and in the digestive tract. Autoradiographic studies of mouse tissues showed a high concentration of I-C14 in distinct regions of the central nervous system. Both become undergo dechlorination in vivo, and were converted to H2O-soluble compounds excreted mainly by the kidneys. Small amounts of unchanged I, but none of the II were detected in faeces. About 95% of the activity was excreted in urine and faeces within 20 d; it was eliminated faster than I. The excretion of C14 was complete after 40 d. (CA 59; 1963, 9228g)


The effect of administering CCI4 to rats on the incorporation of palmitate-1-C14 into liver and plasma lipids was determined. The CCI4 caused a decrease in plasma triglyceride concentration. After palmitate-1-C14 was injected, labelled triglycerides appeared in the plasma in small amounts in treated rats compared to control animals. While in control rats label was incorporated into liver triglycerides rapidly, in control rats there was a 10-20 min lag. Total radioactivity incorporated into liver triglycerides and phospholipids was greater in treated than in control rats. It is suggested that the increase in liver triglycerides caused by CCI4 results from both increased hepatic synthesis and impaired release of triglycerides from liver to plasma. (CA 60; 1966, 37444)


P32-labelled Bayre 23408 (Or-Ral), applied dermally, was found in the urine with part of the absorbed radioactivity partitioned with the feces in the rat and the rest of the molecule intact. The low toxicity of malathion to the German cockroach (as compared with the toxicity to the American cockroach and the housefly) is explained by low penetration through the cuticle. The metabolism of malathion found in insects and mice showed a predominance of phosphatase and carboxyesterase activity in insects and of the latter activity in mice. The low toxicity to mice is explained by the comparatively extensive degradation observed in mice. Similar differences in detoxification were found for other insecticides. The enzymic activities of insect homogenates were examined. (From J. Soc. Food Agroto. 12, 5 (1962) 173)

O-α-dimethyl-O-3-chloro-4-methyl-7-carboxymethyl phosphoroimide.

C\(^{14}\)-DDT absorbed by Salmo salar from 0.3 and 0.1 ppm aqueous suspension was found in all 14 organs and tissues examined, using a direct mount method on lipid extracts. The concentration in the gills was proportional to the aqueous concentration at death, but about 89% times greater. DDT in the gills, heart and liver was wholly or largely present in the blood in these organs. Storage occurred mainly in the stomach, pyloric caeca, intestine, spleen, muscle and skin, and possibly in the kidney. Concentrations per unit weight of lipid showed more uniformity than per unit weight of tissue. Concentration in the lipids may determine toxicity to fish, explaining the greater susceptibility to DDT of fish in poor condition or of low fat content. Absorption from the water was very rapid, indicating that static water testing of insecticide toxicity to fish is unreliable. (Auth.)


Salmo salar salar undergoing were exposed to 1 ppm DDT-C\(^{14}\) and amounts of DDT absorbed on external surfaces and absorbed internally were determined on the basis of C\(^{14}\) activity. Fish killed by exposure contained an average of 0.97 ppm DDT, of which approximately 67% was absorbed. After a 5-minute exposure, appreciable amounts were found throughout the body. High concentrations of DDT were found in the gills, liver, spleen, heart, kidney, gonads and swim bladder. Much smaller concentrations occurred in the stomach, intestines, brain, and spinal cord. The muscles, bone, and integument contained the least. It was concluded that DDT entered the body through the gills. Bioassays showed that an average of 67% of absorbed DDT was non-toxic to mosquito larvae. The absorbed DDT showed little loss of toxicity. (CA 58: 1965, 10311)


When leukocytes from normal subjects and patients with leukemia were labelled with HP-PPP in vitro, myelocytes labelled most intensely. Metamyelocytes and polynuclear leucocytes contained about half as many labelled granules per cell as the myelocytes. Lymphocytes, eosinophils, and basophils did not bind significant amounts of HP-PPP under the conditions of the experiment. A few monocytes were highly labelled. Granulocytes in both blood and bone marrow were labelled after intravenous injection of HP-PPP. The relative degree of labelling was: blood polymorphonuclear neutrophils 1.0, marrow polymorphonuclear neutrophils 0.8, marrow myelocytes 0.5, and marrow myelocytes 0.8. None of the other formed elements in either blood or bone marrow contained significant amounts of the label. (CA 55: 1961, 25944A)

Also published as BM-6445, Brookhaven National Lab., Upton, N.Y. 1960. 16p.


The distribution and elimination of \(^{3}P\)-labelled diazinon and/or metabolic products have been studied in guinea pigs following both oral and subcutaneous administration. The urine was the major route of elimination following oral administration by either method. The more rapid rate of excretion and the relative percentages of the dose in the urine and faeces following oral administration demonstrate that diazinon is efficiently absorbed from the digestive tract of the guinea pig. The accumulation of radioactive compounds in the caecum of the guinea pig following subcutaneous injection indicates that this tissue may play a role in metabolism or elimination of diazinon and/or its metabolites. (Auth. summary)


Organophosphate insecticides, chlorinated hydrocarbons and carbamates were tested with bovine ruminal insects from 10-month-old calves reared in isolation, and previously associated with single species of protozoa. Diazinon-14C (0-chloroethyl-1,2-bis(carboethoxy)ethyl phosphorothioate) substrate uptake was demonstrated with suspensions of ruminal simple and protozoa.}

OKUNO, T., KOIDE, M., FUKASU, T., Sugiura, N. EXCRETION OF 14C-LABELED DDT IN ATLANTIC SALMON. The concentration of DDT in the gills was higher than in the larvae. Concentrations were not detected in the organs. Concentrations of DDT in the liver were not detected. Concentrations of DDT in the fish were not detected.


was dimethyl phosphate. Milk contained no malathion or malathion, but had 0.11 ppm of radioactive material, most of which could not be identified. Blood metabolites were also examined. 3H-labelled malathion was used. (Essentially aut.)


The development of trapping techniques for sampling forest fauna populations is described. The methods used to prepare 3H-labelled malathion (5-dimethyl-3-(1,2-dihydroxyethyl) phosphorodithioate) are discussed. Progress is reported on the project for evaluating the effects of malathion spraying on the ecology of a forest fauna. (NSA 16: 1961, 1962)

II - G - 2 - p PARATHION AND PARACOXON


The distribution of 3H-labelled parathion within the skin following topical application for 1, 2, 4, and 44 h was studied in excised skin from man, rat, rabbit, and cat. Two different approaches were chosen: 1) (a) determination of radioactivity in 25 consecutive cellulose tape strips from the surface of human skin, (b) autoradiography of the same strips, and 2) autoradiography of skin sections with the use of 4 different techniques. Various factors influencing the autoradiograms were studied, special attention being paid to artefacts due to diffusion, type of radiation, and exposure time of the photopositive material. It was found that parathion penetrates into hair follicles and sebaceous glands to some extent, but it was concluded that this is not necessarily the main route of absorption. There also was increasing activity below the epidermal layer, and transdermal absorption is likely.


The tissue distribution of 3H-labelled parathion (E 605, diethyl 4-nitrophenyl thionophosphate) has been investigated by means of an autoradiographic technique applied to sections of whole mice. The animals were injected subcutaneously and were killed at various intervals up to 4 h after injection. The material was absorbed very slowly from the subcutaneous deposit. The level of radioactivity in blood was low during the whole period of observation. However, the labelled material accumulated in various organs and tissues. The highest activity appeared in the salivary glands and cerebral and stomach fat (hepatic gland). Liver, kidney, and adipose tissues showed high uptake of radioactivity, and fairly high activity was found in gastric and intestinal walls, thyroid, spleen, and lungs. Less activity was noted in the central nervous system, muscles, and bone marrow. The labelled material was mainly excreted by the kidney and not in bile or via the intestinal mucosa. The results have been discussed with special regard to the formation of 3H-containing metabolites and breakdown products. The relationship between the distribution of the material and the sequence in which systemic symptoms appear in Parathion intoxications has been pointed out. The fact that the actual tissue distribution of a cholorenergic inhibitor need not necessarily follow the pattern indicated by the enzyme inhibition has been stressed. (Aut.)


Estimations were made of the 3H in the blood and urine at intervals after introducing parathion into the animal of rabbits (25 mg/kg) and cat (6 mg/kg). The cooncentration after 1 oral dose of metaphosphoric (40 mg/kg) was measured at times between 1 min and 2 h in the liver, kidney, brain, spinal cord, medulla oblongata, blood, and urine of female guinea pigs. The distribution of 3H was measured in the liver, kidney, heart, medulla, oblongata, and thyroid of guinea pigs and rabbits. (CA 65: 1061, 1963).

* Mixture of parathion and methyl parathion

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681 Potter, J.L., O'Teale, R.D. IN THE FROG, MOUSE ANI

Apparately high levels of p due to examination of the l to be much less toxic to f with P3 was injected intrapericardial area americana (L.). 4. a cockroaches were removed. Parathion was degraded extracellularly by at least 81.6. In relative 1.2.4; 1 of its toxic intersticless.

682 Casida, J.E., Nieremtiizer PHOSPHATE IN RELATION 5 (1962) 270-7.

The metabolism and residue formed with these, cows, and dairy, and didichlorobenzophenone. In addition, 204 methyl phosphonate-1 metabolites of DDVP, the rapidity, and rapidly, and oxacarboxylate in urine and predominate as unknown derivatives, as may be formed, and some structure and metabolites studied are reported. (Auth.)

683 Hodgson, E., Casida, J.E. VINYL DIMETHYL PHOSPHATE

The metabolic fate of 3H-DDVP. Whole body, and mainly to dimethyl phosphates, are formed. No evidence accounts for 10% to 10% of dehydroxylation further investigation. The stimulation of others is examined and the mechanism Agri. 12, 5 (1964) II-B1C

See also:

497 Radiotracer in the Lardquist, 1963)

502 C3P diclofenac in mice

506 Insecticides and in vivo microorganisms, etc.

506 Syntheses and studies and in labeled animals

527 The excretion of C3P (Munod et al., 19...

Apparently high levels of parathion without increased toxicity in insects treated with parathion might be due to examination of the whole body and not the nervous system alone. Since parathion has been shown to be much less toxic to frogs and mice than to mice, the effect carried out in which parathion labelled with $^{32}P$ was injected intraperitoneally into mice and frogs and intrasubcutaneously into females of Periplaneta americana (L.), after which the brains of the frogs and mice and the ventral nerve cords of the cockroaches were removed and the nervous tissues and remaining whole bodies homogenised for testing. Parathion was degraded extremely rapidly in the intact mouse and about half as fast in the frog and cockroach. At no time were the parathion levels in body and central nervous system substantially different. Parathion in vivo had relative potencies against nerve cholinesterase of mouse, frog and cockroach of 70:1:1. Its relative LD50's by injection were 5.3:7.6:1. It is concluded that the low toxicity of the frog is due to its insensitive cholinesterase and is unassociated with degradation rates.

11 G 2 q VAPOUR


The metabolism and residues of 2,4-dichlorovinyl dimethyl phosphate–$^{32}P$ (DDVP or Vapona) were examined with rats, cows, and a goat. Studies with rats and also utilised carbon labelled DDVP, dichlorodiethylene, and dichloroethane, and $^{32}P$-labelled $\beta$-methyl 2,4-dichlorovinyl phosphate and $\alpha$-methyl 2,4-dichlorovinyl phosphates. A number of nerves and a single cow were treated orally with 2,4-dichloro-2,4-dichlorovinyl dimethyl phosphate–$^{32}P$ (Dibrom). These insecticides are rapidly hydrolysed in mammary containing metabolites of DDVP, $\alpha$-methyl 2,4-dichlorovinyl phosphate, are low in toxicity and rapidly excreted or further degraded. The carboxylic 2,4-dichlorovinyl group in DDVP is excreted in urine predominantly as a conjugate of dichloroethane, probably the glucuronide. In the faeces as unknown derivatives, and in the expired air as carbon dioxide. Small amounts of dichloroacetic acid may be formed, and some of the $^{32}P$ persists in liver, blood, and other tissues in an unlabelled form. Limited metabolism studies of DDVP in plants and of DDVP and Dibrom in bovine rumen fluid are also reported. (Auh.)


The metabolic fate of DDVP by the action of mammalian enzymes is studied in vitro using $^{14}C$-labelled DDVP. Whole homogenates of liver, kidney, spleen, and adrenal gland of rat and rabbit convert DDVP mainly to dimethyl phosphate but some des-methyl DDVP, monomethyl phosphate and inorganic phosphate are also formed. No evidence of any other $P$ containing metabolites was obtained. Dimethyl phosphate accounts for 95-100% of the DDVP hydrolysed by the plasma of both species. Liver enzymes metabolise des-methyl DDVP further via dichloroacetaldehyde to dichloroethane and probably dichloroacetic acid. The stimulatory or otherwise effect of various cations, e.g., Mn and Co, on the enzyme activity is examined and the mechanism of the hydrolysis of DDVP in these systems are discussed. (J. Sci. Food Agric. 13, 5 (1962) 212-20)

See also:
497 Radioisotopes in the study of the fate of insecticides applied to animals and plants. (PLAPP and LINQUIST, 1963)
553 $^{32}P$-dichloro in mice. (HEATH, 1965)
816 Insecticides and metabolism. II. Metabolism of $^{14}C$-labelled Aldrin and $^{32}P$-labelled dieldrin in microorganisms. Liver homogenates and mosquito larvae. (KORTE et al., 1966)
526 Syntheses and studies on some $^{32}P$-labelled insecticides belonging to the halogenated hydrocarbons and on labelled trichloroethylene. (KORTE et al., 1969)
527 The excretion of $^{32}P$-labelled Aldrin and Dieldrin as well as their metabolites via the bile. (MENZEL et al., 1965)
II - G - 3 INSECTICIDE METABOLISM IN PLANTS

II - G - 3 - a. GENERAL


Current knowledge of the metabolic fate of insecticides in plants is reviewed and documented (104 references), with particular attention to the synthetic routes available for labelling organophosphates with 32P and the use of these compounds in metabolism studies. Radioisotopes are considered to be the most useful method for establishing the metabolic pathway of an insecticide. A detailed table on radioisotope studies on the metabolism of organophosphate insecticides by plants is included which gives details of absorption and translocation, hydrolysis products and non-hydrolyzed metabolites.

685 WEST AFRICAN COFFEE RESEARCH INSTITUTE, 1959-60, L

Armstrong states that, in w (large) and methyl-dest, an experiment in which my dicoxsaoe, radioactivity 16 inches after 1 d. and 72


P4-labelled schradan soon: coriin and sugarcane plants absorbed by the roots of the

687 Hasekaylo, J., Lindquist, J. RECOVERY FROM SOIL.

Small plot field tests were granular applications; plants with photosynthetic efficiency treatment. Studies with P4 labeled by both methods, I, 5 inches 1 to 7 weeks after form and water decreased in amounts of radioactivity with

688 Hasekaylo, J., Lindquist, J. AND DISTRIBUTION IN TH.

Cotton plants grown in sand in the leaves under various with dicoxsaoe as a soil in and bolls. Less than 1% of which the developing cells in dicoxsaoe-treated mort.


The excised-leaf technique specific activity of 3500 cpb but increased slightly these were identified. The meta remained relatively constant metabolic degradation of Dl found in mammal but dicoxsaoe in leaves effect.

299 Microsomes of C14-labelled insecticides and some biochemical studies. (Rothier, 1962)
300 The metabolism of hexachlorocyclohexane isomers and the effect of microwave-activating drugs. (Kozynsky and Portig, 1962)
302 Metabolism of chlorophenolamines (DDT). (Rothier et al., 1967)
303 Synthesis of Telodrine-C14 and its transformation by microorganisms, mosquito larvae and rats. (Sjösted, 1965)
304 Metabolism of radioactively labeled 5-(dimethoxyphosphoryl)-N,N-dimethyl-2-chloroaniline (Stadlb, 5N 32P) in man and mammals. (Menzel, 1969)
305 Biological and chemical properties of dimethoate and related derivatives. (Reddy and Anbar, 1963)
306 Reaction of certain phosphonoothionate insecticides with alcohols and potentiation by breakdown products. (Casta and Sandstrom, 1963)
307 Metabolism of Fumon in mammals and insects. (Sjösted, 1969)
308 Distribution of orally applied metidathion-S4 in a forest ecosystem. (Gilles and Parer, 1963)
309 The effect of SKF 625A (2-dimethylaminoethyl 2,3-diphenylvalerate hydrochloride) on organophosphate metabolism in toads and mammals. (C'Brion, 1961)
310 Toxicologic studies of organophosphate sublimates. (Timmerman, 1969)
311 The penetration of an anticholinesterase agent (Tabto) into skin. II. Autoradiographic studies. (Blazek et al., 1969)
312 Percutaneous absorption of sarin and two allied organophosphorus cholinoesterase inhibitors. (Fredriksson, 1965)
313 The distribution of radioactive phosphorus in the blood and tissues of rabbits treated with tagged isopropyl methylphosphonofluoridate (Tabto). (McNall and Able, 1960)
314 Studies on the mode of action of organophosphate compounds. Part I. Metabolic fate of 32P labeled simazine and methyl parathion in guinea pig and white rat. (Miyamoto et al., 1969)
315 Systemic action of two insecticides on earthworm parasites of rabbits and cattle. (Adkins, 1961)
316 Radioactive-labelled phosphorus acid ester. III. The fate of 32P-labelled pyridoxine following intravenous or intramuscular injection into cattle. (Dodds and Klissner, 1962)
317 Non-hydrolytic pathway in metabolism of Sevin. (Doroghe and Casta, 1965)
318 Non-hydrolytic pathway in metabolism of M-methylcarbamate insecticides. (Doroghe et al., 1965)
319 Conjugates of carboxamides metabolism of Sevin. (Leeing and Kadana, 1965)
320 Insecticides in metabolism. IV. Dibenzylmethane. (Caste and Schelle, 1965)
321 Metabolism of radio-labelled systemic insecticides in animals. (Waldklaus et al., 1969)
322 Residue and metabolism of radioactive 4-nitro-3-benzyl-2-chlorophenyl methyl methylphosphonofluoridate administered as a single oral dose to sheep. (Brewer and Skene, 1969)
323 Percutaneous absorption of parathion and parathox. IV. Desensitization of human skin from parathox. (Fredriksson, 1961)

Ammon vulgates that in screening tests of 9 systemic and semi-systemic insecticides, dimethoate (Roby 69) and methyl-parathion (Meta cyanophos) appeared likely to be the most useful of foliage sprays. In an experiment in which mature leaves at the distal ends of fans and chuponos were painted with 3H-labelled dimethoate, radioactivity was detected at mean distances from fans and chuponos, respectively, of 14 and 19 inches after 3 d, and 78 and 64 inches after 14 d. (From R.A. 61: 1968, 119).

II - G - 3 - c COCONUT


3H-labelled schradan solutions were used in dipping and irrigation experiments on cotton seedlings, and cotton and mangoes plants, respectively. Rate and degree of translocation indicated that schradan is absorbed by the roots of the plant, the rate of subsequent translocation varying with the species. Uptake of schradan from film was tested on nymphs and adults of Drosophila suzukii F. (Diptera: Cecidomyiidae). (Permeated at various temperatures, then released on filter paper soaked in 1 ml of 0.5% solution of radioactive schradan). All nymphs were dead by then 2nd day. Schradan was picked up from film in considerable quantities, confirmed by assays on dead and live insects. The uptake apparently increased with rise in temperature.


small-plot field tests were used to study phorate uptake by cotton plants following seed and in-furrow granular applications; phorate recovery from the soil was studied also. In-furrow granular treatments with phorate reduced phytotoxicity and gave soil long control similar to that with the standard commercial treatment. Studies with 3H-labelled phorate showed similar amounts of phorate-equivalents in plants treated by both methods. Residues of soil cores showed 10% or more of the radioactivity in the top 1.5 inches 2 to 7 weeks after planting. The combined quantities of radioactivity extractable with chloroform and water decreased with time to a low of about 5% in each of the treatments. Generally, similar amounts of radioactivity were recovered in the chloroform and water extracts. (Auth.)


Cotton plants grown in sand culture treated with 3H-labelled dimethoate accumulated more insecticide in the leaves under environmental conditions which favoured transpiration. Fumigating cotton plants treated with dimethoate as a soil drench accumulated relatively small amounts of the constituent in the squares and bolls. Less than 1 µg of dimethoate-equivalents was found in the soil plus plant of squares upon which the developing boll weevil (Anthonomus grandis Boheman) larvae feed. Young cotton plants grown in dimethoate-treated nutrient solutions did not absorb the insecticide at the same rate they absorbed water. Also, plants grown in nutrient solutions deficient in phosporus absorbed less insecticide than plants grown in a complete nutrient solution. (Auth.)


The oxidase-leaf technique was used. 3H-labelled dimethoate was used, with a final 95% purity and a specific activity of 33,000 cpm/µg. The half-life of the systemic insecticide was 1.8 d through a half lives, but increased slightly thereafter. 11 metabolites were resolved by paper chromatography, and 4 of these were identified. The metabolite found in largest amount was the carboxy derivative. The oxygen analogue remained relatively constant but consistently less than 6% of the total metabolites recovered. The proposed metabolic degradation of dimethoate after its introduction directly into the cotton leaves is similar to that found in insects but dissimilar to that reported when the insecticide was applied as a foliar spray. Its metabolism in leaves deficient in K., P., and Fe is also reported.

En l'absence de précautions appropriées, la décomposition des plantes traitées à l'aide d'insecticides endothéraux dépend à la fois de l'incorporation des dépôts superficiels et de la dégradation du principe actif dans le sol. Ces deux phénomènes ont été étudiés sur plusieurs plantes maraîchères traitées au déméton-M et à l'endothion, marqués respectivement avec 32P et 95S. La vitesse d'incorporation des dépôts superficiels est comparable pour l'endothion et le déméton-M, lorsque les conditions environnementales sont identiques. Au niveau de feuillage, la présence du déméton-M et de ses métabolites située varie selon la plante traitée. Elle est en général supérieure à celle de l'endothion dans les sols riches de décomposition ne comprenant que des produits d'hydroyse azotées. Dans les plantes traitées au déméton-M, la dégradation apparente semble être plus rapide; pour l'endothion, au contraire, elle reste comparable à celle que l'on observe dans le feuillage et ne semble pas affectée par la maturation du fruit. Les résidus toxiques renommés dans les fruits peuvent être étudiés, soit à une distance de l'insecticide provenant du feuillage, soit à une distance de l'insecticide provenant du sol. L'importance relative de ces deux phénomènes a pu être précisée grâce à une étude comparative des fruits, traités ou non, portés par une plante alle-mêmes traitée. La pénétration et la diffusion du déméton-M et de l'endothion dans les pousses d'asperges sont étudiées afin de tester l'aptitude du comportement de ces deux insecticides dans le buisson (Platypterus polystegus). Le métabolite est en évidence si l'on veut le modifier.


Absorption of 32P-labelled phosphate by the seedlings depended on the volume of the radiotrophic or hydrophilous plant. The translocation was slower in the plants more rapidly than was phosphate; the reverse was true of upward translocation. (J. Sci. Food Agric. 18, 9 (1968) 137-48).


The absorption of 32P-labelled phosphate by cotton was investigated under laboratory, greenhouse, and field conditions. The treated seeds absorbed much more phosphate than intact seeds; however, the increased amount of phosphate in the treated seed did not reduce germination or radicle growth. Absorption of inorganic 32P was not appreciably inhibited by the seed coat. Water absorption and respiration of germinating cotton seeds was markedly different between untreated and treated seeds. Cotton plants grown in sand and soil from phosphate-treated seeds absorbed 9% to 12% of the applied dosage, chiefly during the first 5 days after planting. (Auth.)


Dimethoate was not exceptionally effective as a systemic cottonseed treatment against the boll weevil (Anthonomus grandis Boheman) and cotton aphid (Aphis gossypii Glover). Applied as a root treatment, dimethoate caused considerable reduction in seedling emergence. Studies with 32P-labelled dimethoate applied as a cottonseed treatment indicated that the toxin was most rapidly absorbed 1 to 3 days after the treatment. Dimethoate seed treatment did not reduce the total emergence of artificially detritated seeds, but reduced the rate of emergence somewhat. Seeds detritated for 2 days absorbed more dimethoate than seeds detritated for 0, 1, 2, or 4 days. Dimethoate was found to be less toxic than phosphate to boll weevil larvae and adults. (Auth.)

946 Coombes, B.G. ABSORPTION OF GCE IN THE GRAPE VINE. Schraden, dimethoate and dinitropropylamine are among the most useful treatments for grapevine. Phytophthora vitis causes various treatments such as 2-copper and 2-silver treatments have been used. Absorption of GCE in the grape vine is important for the effective treatment of grapevine. (Auth.)


A review of relevant activities in the field of radiation and radionuclides in the fields of application. Radionuclides such as 32P and 35S were used as indicators in the study of the growth and development of plants. (Auth.)

949 Gambins, L., Pops, A., Com TE. ESTABLISHMENT DES POPULATIONS DE INSECTES DE L'EXPÉRIENCE EN PÉDAS. 1. Pédales, contre 0,24 mg, peuplent robustes de 2 ans, pa
Thao, C.H., Clark, F.W.  
**ASSIMPTION AND TRANSLOCATION OF DI-SYTON BY COTTON PLANTS.**  

The absorption and translocation of 3H-labelled Di-Syton (Q,O-alcohol, &-[5-ethylidene-7]-phosphorobenzimide) were studied by means of foliage, seed, and soil treatments. The compound was readily translocated to leaves and stems from treated leaves or soil, but in these limited experiments it did not concentrate in fruiting forms. Distribution of Di-Syton leached from germinated and ungerminated treated cottonseed into the surrounding soil showed definite downward and to a lesser degree, lateral movement. 

**II- G- 3 - c GRAPE VINE**

Cookbe, B.G.  
**ABSORPTION AND MOVEMENT OF PHOSPHORUS-32-LABELED SYSTEMIC INSECTICIDES IN THE GRAPE VINE (Vitis vinifera L.).**  

Scheredian, dimetho and demeton-S, containing 32P, were applied by different methods at different times to study their behaviour, particularly their accumulation in roots, as a means of controlling the nourishing post, Phylloxera vitifoliae. Foliage sprays, ‘capsule’ treatment, and banding of the trunk (with various treatments such as chelating, abation and ripening) gave low insecticide levels in the roots, but sometimes high levels in the leaves. Watering in November and February, and shoot injection in April, have 17 mg of Scheredian per kg of soil, 15 mg after treatment, and decomposition was slow. Dimetho was absorbed to a similar extent but decomposed rapidly and was phytotoxic when applied in a trunks band. Demeton-S gave low root levels and did not move easily in the phloem.

**II- G- 3 - f PINEAPPLE**

Gomer, W.A.  
**RADIOISOTOPE STUDIES OF PESTICIDE METABOLISM BY THE PINEAPPLE PLANT.**  

Review of relevant activities in author's institute, 24, P and S were used in a series of studies, Radioactive Syton, di-Syton (Bayer 1963) and dimethoate were studied as systemic insecticides. Results of experiments with 34S indicated that an adequate insect control was not due to detoxification or immobilization mechanisms in the plant, but rather to inadequate penetration of the insecticide into tissues at the site of application. Radioactive naphthyl (Pseudomonas brahmani) were obtained by feeding on C40-labelled pineapple leaves or nutrient media containing 32P. Paper chromatography and subsequent autoradiography permitted identification of the free tagged amino acids and sugars in the insects themselves, in their oral secretions and in their excretions. A few interesting differences were observed in the autoradiographs.

**II- G- 3 - g POPLAR**

Carrau, L., Popa, A., Constantinac, V., Constantinac, O., Constantinac, E.I., Halasa, C.  
**L'Etablissement des Processus d'Absorption et de Diffusion des Insecticides Systemiques au Populus X euramericana de Gomer (sibsonia).**  

Pour étudier le mécanisme d'absorption, de diffusion et de localisation des insecticides systémiques en ce qui concerne le peuplier et les canules, espèces fréquemment attaquées par les insectes xylophages, on a fait des recherches en employant le "diperasol" marqué sur le peuplier Populus E00. Le marquage de l'insecticide a été fait dans un réanimateur, en utilisant comme cible le diperasol en poudre (1,5 g), avec un flux = 104 n/cm² et à une température de 20 à 40°C. L'introduction a été effectuée jusqu'à l'obtention d'une activité absolue de la cible = 1 mc. Tant en laboratoire qu'en pépinière, l'insecticide a été accumulé en plus grande proportion dans les feuilles. Pourtant, au contraire une augmentation importante des accumulations d'insecticide dans les racines et dans le bois de la tige, surtout au bout des plants, dans l'expérience en pépinière. En général, l'accumulation d'insecticide a été de 1,65 mg/g substance verte ou pépinière, contre 0,74 mg/g en pot. Il en résulte que, dans les conditions de terrain, les plants de peupliers Robusta de 2 ans, pendant le temps sec, peuvent mobiliser le diperasol administré en solution.
II - G - 3 - h RICE

689


It has been confirmed that 1st instar larvae of the rice stem-borer, Chilo suppressalis Walker, can be killed when 14C-SHC is applied to the paddy field soil before transplanting rice seedlings. In order to establish the translocation route to the lower parts, 14C-14C-SHC (0.6 mg at 3.5 µg/mg to 1 litre of water) was used in culture solutions (final concentration < 2.4 µm). Rice seedlings of about 40-50 cm in height were cultured in water for 1 week, to develop new roots. After immersion of the roots in culture solution for 65 or 119 h, the treated seedlings were exposed to X-ray film for about 3 months. Autoradiograms show that 14C in SC is absorbed from the roots and translocated to stems and leaves through vascular bundles. In other experiments, absorbable cotton soaked with vaseline was applied to the stem to check on capillary creeping, once the roots were immersed in the radioactive solution. Paper chromatography and gas flow counters were used for assay. Results indicate that 14C dissolved in water is not only absorbed and translocated to stems and leaves but also creep up over the surface of leaf sheaths by capillary action. For 14C-SHC applied to irrigation water from the surface the main route of translocation appears to be via the leaf sheath surfaces.

II - G - 3 - 1 TEA AND CABBAGE

690


The insecticidal fate of 85-labelled malathion and methyl parathion, sprayed on rice plants, was examined. When the insecticidal rate of the Insecticide was examined by the paper chromatography, the ratio of the insecticide metabolites between chloroform and trichloroacetic acid in aqueous solution, the greater part of the insecticide metabolite contained in rice grains was water-extractable even 1 week after spraying. The water extracts of the insecticide metabolites in rice grains were subjected to iso electronic chromatography, and the existence of several hydroxyl products was confirmed for both malathion and methyl parathion. The main metabolites were thioephosphoric acid, malathion, and thioester acid, C2- dimethyl thioester acid and Q-p-nitrophenyl thiophosphoric acid for methyl parathion.

II - G - 3 - k SUGAR CANE

See 668

II - G - 3 - L META
II - G - 9 - 1 METABOLIC EFFECTS OF INSECTICIDES ON (labelled) PLANTS

(vegetables, potatoes, apple trees)


The effect of varying doses of hexachlorobenzene and DDT on the assimilation of P<sup>32</sup> by plants was studied on wheat, potatoes, and apple trees. The exposure was for 3.5 h and 3-10 d. The characteristics of P<sup>32</sup> absorption by plants were intimately related to the nature of insecticide action and to the duration of exposure of the plants to the poisons and environmental conditions. By using stimulating doses of the preparations, assimilation was accelerated and 1-3-5-fold more P<sup>32</sup> accumulated in treated plants than accumulated in untreated. Exhibiting doses of the insecticides caused a decrease in assimilation and accumulation of P<sup>32</sup> within 24 h. Phytocidal doses suppressed P<sup>32</sup> absorption for a long period. Combined use of insecticides and P<sup>32</sup> accumulated P<sup>32</sup> absorption, efficient use of insecticides in combination with fertilizers protects the plants from harmful organisms and increases yield. (CA 58: 1965, 105174a)

See also:

568 The metabolism of hydroxymalic acid. (Teichnische, 1989)
570 Subject on the mechanism of fungicides. (Jap. Food Research Inst., Tokyo, 1960)
571 The absorption of sulphur dioxide by fit trees. (Matsumi and Kohnum, 1963)
572 The spatial distribution of δ<sup>31</sup> and the identity of the tagged compounds in leaves of spinach after treatment with δ<sup>31</sup>Os gas. (Weigl and Ziegler, 1963)
573 Syntheses and studies on some C<sup>15</sup>-labelled insecticides belonging to the halogenated hydrocarbons and on labelled piperidines. (Kore et al., 1962)
574 Meteorological methods of C<sup>15</sup>-labelled insecticides and some biological studies. (Rechman, 1962)
575 Systemic nature of γ-BHC in plants. Mode of action of BHC. II. (Dhill et al., 1956)
576 Glowing experiments on the translocation of topically applied radioactive γ-benzene hexachloride-C<sup>14</sup> in certain woody plants with insect galls. (Teichnische, 1961)
577 Fate of C<sup>15</sup>-dimethyly-4-(3-methyl-2-thiopheneoxy-methyl) thiophosphate sprayed on rice plants. (Pulida et al., 1962)
578 Metabolites of radiolabeled δ-(dimethoxyphosphoryl)N,N-diisopropyl-2-nitrosoethylamine (Ehrlau, SD 5583) in beans and marmalades. (Meiner, 1965)
579 Behavior of δ<sup>31</sup> labelled Rogor applied to plants (by spray treatment). I. Penetration and translocation of Rogor<sup>31</sup> applied to the trunk of the lemon tree. (Pietsch-Tonelli and Barchenti, 1961)
580 Behavior of P<sup>32</sup>-labelled Rogor applied to plants (by spray treatment). II. Penetration and translocation of P<sup>32</sup>-labelled Rogor sprayed on crops. (Pietsch-Tonelli and Barcelont, 1961)
581 Behavior of δ<sup>31</sup>-labelled Rogor applied to plants (by spray treatment). III. Penetration and translocation of δ<sup>31</sup>-labelled Rogor applied by spraying herbaceous plants and trees. (Pietsch-Tonelli and Barcelont, 1961)
582 Systemic migration and insecticidal activity of dimethoate applied on tree trunks. (Pietsch-Tonelli et al., 1961)
583 Penetration, translocation and metabolism of δ<sup>31</sup>-labelled Rogor applied to the trunk of the lemon tree. (San et al., 1961)
584 Metabolites of δ<sup>31</sup>-labelled dimethoate in olive fruits and some ecotoxicological implications. (Sanet and Giacconcelli, 1963)
585 Study on the metabolism of δ<sup>31</sup>-labelled Rogor in sugar and fodder beet. (San et al., 1962)
586 Penetration, translocation, and metabolism of Rogor<sup>31</sup>P applied on lemon tree trunks. (San et al., 1961)
587 Chemical and biological behavior of fenthion residues. (Alcasfi et al., 1963)
588 On the occurrence of biologically active metabolites of the active ingredient 3,375G after application of LEARYCIDE<sup>19</sup> (Nielsen, 1962)
589 Distribution of aerially applied malathion-3<sup>14</sup> in a forest ecosystem. (Geiss and Pfeifer, 1963)
II - H Insecticide Residues in

II-H-1 ANIMALS AND ANIMAL PRODUCTS

II-H-1-a GENERAL


Review article on applications of radioisotopes to pesticides. The usefulness of labelling for studying their structure and mode of action is discussed, and particular stress laid on their role in residue determinations.

See also:

547 Metabolism of systemic and other recent insecticides in animals. (Arthur, 1962)
548 Use of radioisotopes in studying the absorption, distribution, and elimination of certain insecticides in animals. (Panov et al., 1963)
1549 Instrumentation in pesticide residue determinations. (Gunckel, 1962)
711 Polymer-insecticide systems as livestock feed additives. (Aber, 1960).
717 Some problems in the determination of residues in plants and mammals. (Heath, 1963)

II-H-1-b SHEEP


Sheep were given single oral doses of the isotope and samples were taken at intervals for periods up to 21 days post-treatment. Residue and metabolites were determined in the blood shortly after treatment, but by 2 days the residue had decreased to a low level. Over 85% of the administered was recovered in the excreta. The isotope in the urine, amounting to 75% of the dose, was primarily in the form of hydrolys products of Residue. Some of the Residue was hydrolyzed completely to inorganic phosphorus and retained in the animal tissues, 10% as natural phosphate esters and 10% as inorganic phosphorus. Residue itself was retained in the tissues after 7 days.
II - H - 1 - C CATTLE - MEAT AND DAIRY PRODUCTS

704
Cuthbert, J. K., PESTICIDES RESIDUES. USE OF RADIOACTIVE TRACER METHOD TO DETERMINE POSSIBLE RESIDUES IN MILK AND MEAT FROM DAIRY COWS. Paper No. 1727, Industrial Journal Series, Minnesota Agricultural Experiment Station, St. Paul, Minn., 1960.

The sensitivity of the isotope dilution method for such residue determinations is discussed. The method is illustrated for C14-labeled methyliodide in milk. It is suggested that such techniques might be profitably incorporated into earlier stages of food production, e.g., poultry feed, before using cows. (Paper presented during 46th midyear meeting, Chemical Spectral Brian Manufacturers Association, Chicago, 17 May 1960).

705

Comparisons of plots of crops taken at various times after spraying wheatmeal on cattle, including bays of selected areas on cattle sprayed with DDT and methoxychol, and radiometric measurements of heavy and light taken during and after confinement from a year sprayed with C14-labeled DDT. It showed that the loss of treated treatments from an animal's body could be accounted for by the absorptive action of the soil, contact with ground, rubbing and other exercise. (Unabridged).

706

The uptake of DDT and hexachlorocyclohexane (I labeled with C14 and C13, respectively, by the cow through the skin, the outflow of radiactivity after loading, and toxicity of milk containing 1 were studied. A cow was sprayed with DDT in oil in 2 doses of 32 and 33.9 mc C14/kg body weight at intervals of 104 d and sacrificed on the 105th day after the 2nd spraying. It resulted in secretion into the milk of 23,72-25,2 mg of DDT within the first 10 d. In urine and feces 2/3 of DDT was excreted and 80% of DDT in milk remained unchanged. DDT was deposited in all parts of the animal body. A cow treated with 3 applications of 1 each of an aqueous mineral oil emulsion containing 2% I, at intervals of 3 d gave milk containing the following amounts (mg/l of milk): 1st treatment 13 mg after 6 h, 2nd treatment 146 and 216 mg after 6 h, respectively. It was secreted in the milk in appreciable quantities for at least 3 months after treatment was discontinued. Experiments 130-260 g of DDT daily became metabolized, developed twitching of limbs, and finally died after 7-11 d. (CA 66, 1962, 6420).

707

An alkylated acryl polyurethane alcohol, General Chemical 4072 (2-chloro-1-(2,4-dichlorobenzyl) diehtyl phosphate) was labeled with pred. Samples were used to study the secretion of the compound in the milk following applications to the cow. Four times the amount of milk produced, percentage of butterfat, and protein of all treatments in milk of treated cows. Data indicate that absorption, as determined by the secretion levels, is greater when the spray is brought into contact with the skin.

708

Extraction techniques used are described. Amounts of the acaricidal, n-hexane, water, and milk residue were assayed for total radioactivity. The F6-labeled Co-Et, Ringer(7), Bayer 2940, and Bayer 25406 were assayed with an end-window Ge-1 tube; the analysis of C14-labeled DDT and C13-labeled Keppone(7), and dibutyl were made with a wideband gas-flow counter according to laboratory procedure described previously(7). The percentage recovery of these insecticides from milk was based on the amount of radioactivity appearing in the faecal samples from 6 separate determinations. Recoveries of Sevin(7) (1-naphthyl N-methylcarbamate), Keppone(7) (dichloroacetone-1,3,4-diehtyl-6-cyano) (44-67%), Bayer 2496 (C4-diehtyl-d-4-6-methylthiocarbamyl) (67%), Bayer 2496 (C4-diehtyl-d-4-methylthiocarbamyl) (67%), Raladone(7) (3,6-diehtyl phosphorochloridate), and CoEt(7) (C4-diehtyl-d-3-chloro-4-methylthiolethylene) phosphorochloridate (7) from milk ranged from 87% to 97% using acaricidal and chloroform as the primary extraction solvents and acaricidal-n-hexane as a cleanup procedure. These extraction procedures were somewhat less effective for...

J. econ. Ent. 54: 1960, 848.
Thirty White Leghorn hens were dosed with 14C-labelled Co-Ral® (Q-Diethylphosphonic Acid) and 14C-(3-chloro-4-methylumbelliferone) phosphoconitroimin at Bayer 21/119 at 50 mg/kg. Twenty hens were dosed once, while 10 hens received 5 applications at weekly intervals. Some intact Co-Ral remained on the feathers and skin for 23 d after treatment. The liver, kidney, and bone contained more radioactivity than other internal tissues. By 3 d after treatment, acetone-soluble residues in internal tissues were negligible. The eggs contained minuscule quantities of acetone-soluble residues at 5 to 7 d after treatment of the hens, but these residues were not characterized as Co-Ral or its oxygen analog. Radioactive materials excreted in the feces consisted of residual Co-Ral, the oxygen analog, Q-Diethylphosphonic Acid and Q-Diethylphosphonic-Acid-Acetic Acid. Phospholipids, phosphoric acid, and diethylphosphoric acid acetate, deoxyribonucleic acid, and acetic-soluble phosphorus compounds were isolated from the liver and feces. (Aust.)


pH-labelled Co-Ral® was mixed in laying mash at 100 ppm and fed to laying hens for a max. of 7 d. The highest concentration of total radioactive residues was in the liver and kidney. Deposition of Co-Ral or metabolites in the fat was minor. The liver, kidney, and glandular contained the highest concentrations of acetone-soluble materials. Acetone-soluble residues were not present in any tissue after the hens were returned to normal feed for 7 d. Small but detectable amounts of acetone-soluble materials were present in egg yolks analyzed at 11 to 15 d after treatment, but none was present in the albumen. About 70% of the radioactivity consumed in the feed was excreted in the feces by 28 d after treatment. More than 80% of the excreted radioactive materials were hydrolytic products. Unchanged Co-Ral, the oxygen analog of Co-Ral, Q-Diethylphosphonic Acid, and Q-Diethylphosphonoethanol acid were isolated and characterized from the feces. (From auth.)


pH-labelled phosphonic acid and Q-Diethylphosphonic Acid were fed at 100 ppm in the diet of laying hens for 7 d. The liver, kidney, and bone accumulated more radioactive materials than the blood, brain, breast, fat, feathers, glandular, or skin. Egg yolk contained more acide equivalents than the shell or white. Acetone-soluble residues were detectable in the feces, egg yolk, and liver. About 40% of the phosphonic acid and 20% of the diethylphosphonothioic acid consumed and present in the feces 14 d after treatment. The phosphoric acid and diethylphosphonic acid exhibited solubility properties characteristic of many organophosphate insecticides. (Aust.)

II - H - 1 - f MAN


The efficiency of a decontamination procedure for removing pH-labelled parathion (6% diethyl 4-nitrophenyl thiolethyl) from the skin surface of human volunteers was tested. Two series of experiments, each using 4 men, were performed, the material being left on the skin for 30 and 300 min, respectively. The radioactivity was determined before and after the decontamination procedure, and the results analyzed as percentages of the initial amount after subtraction of the background counts. After ordinary washing with soap and water for 30 sec a residue of 20-30% and 8-10% for the long-term and short-term groups, respectively, remained. An alcohol wash immediately after the initial washing still left a considerable residue (> 10% and > 5%), respectively. A final cleaning with soap and water left a residue of > 5% in the long-term series, the skin being almost completely decontaminated for the other. The theoretical aspects of the time factors involved are discussed and the practical implications within the field of occupational medicine stressed. (From auth. summary.)

See also:

678 The metabolism of orally administered malathion by a lactating cow. (C'Oem et al., 1963)
679 Studies on the percutaneous absorption of parathion and paraoxon. II. Distribution of pH-labelled parathion within the skin. (Predzioz and Bigelow, 1963)
680 Tissue distribution of pH-labelled parathion. Autoradiographic techniques. (Predzioz and Bigelow, 1965)
681 Detection and distribution of pH-labelled diazinon in dog tissues after oral administration. (Millar, 1969)
The metabolism of $^{32}$-labeled dimethoate in sheep. (Chamberlain et al., 1961)

Absorption and metabolism of Bayer 29469 by dairy cows and residues in the milk. (Butteram and Arthur, 1961)

A study of the absorption of $^{14}C$-labelled DDT from water by fish. (Holden, 1962)

Radioactive labelled phosphoric acid esters. III. The fate of $^{32}P$-labelled Wotex following intravenous or intramuscular injection in cattle. (Ueshik and Kihara, 1962)

Toxicological studies of organophosphorus antiparasitics. (Timmerman, 1962)

Radioactive labelled phosphoric acid esters. I. Preparation of $^{32}P$-labelled dimethoate of the 6-methyl-mercaptoethyl thiolphosphonic dimethyl ester and their hydrolytic breakdown in the plant.

**II-H-2 INSECTICIDE RESIDUES IN PLANTS AND PLANT PRODUCTS**

**N-I-H-2 a GENERAL**


Chemical and biochemical methods of residue determination assume that the nature of the toxic compounds present is known, and that they can be extracted in known yields. Neither assumption is easily validated except by using radioisotopes. The use of radioisotopes to investigate these problems is described, with examples taken from work on dinitro and dimetan (DDT) and the fungicide thiophanmethionate (SDM).


A method has been developed for the detection of residues of systox and its metabolites in plants. The method is based upon chromatographic separation on paper and subsequent characterisation through the use of the colour-forming agent, 2,2-dichloro-1,1-dicyanoethane. Recovery data were obtained using $^{32}P$-labelled compounds. The radioactivity was measured on paper chromatograms with a strip counter. In 11 of the 20 cases recoveries were >70%, in 7 = 50-70%, and only in 2 < 50%. Even when the recoveries obtained in a few cases, the method is still capable of detecting 3 ppm of the Systox thion isomer or the sulfonate or sulfates of either isomer. The thion isomer itself was not included in this recovery experiment as radio-labelled material was not available. The method will distinguish residues of Systox and its metabolites in the presence of other organophosphorus pesticides and cholinesterase inhibitors. With the application of a preliminatory chromatographic cleanup procedure, the method has been used for the detection of Systox residues in a large number of crops.


A tendency similar to methyl parathion was observed with $^{32}P$-labelled Baycid. (CA 60: 1664, 4746)


The disappearance of residual films of insecticides from plant and other surfaces may be conveniently studied if the insecticide is labelled with a radioisotope of sufficient radiant energy for a simple measuring technique. Methods of application of insecticide solutions to surfaces or direct measurements on the rate of volatilization of $^{32}P$-labelled diethyl and aldrin crystals from glass surfaces are described. (Auth.)

721 Bazai, B., Sautj, R. CANDELE. (ESTERI STERICO DELL'ACETI DETERMINAZIONE KOLLE MEI SU STRATO SOTTOLE. (Deter pheryl-1-phenylactic acid) is based on P by chromatography Generale per l'Industria Miller Geesus emanazione.

A colorimetric method for the determination of Candalas is described. A sample of the extract from the oil is employed with Cicala in the distillation or chromatography determination. $^{32}P$ labelled $\gamma$-cyhalothrin was used. Deactive ingredient may be extract


A method has been developed for the detection of residues of systox and its metabolites in plants. The method is based upon chromatographic separation on paper and subsequent characterisation through the use of the colour-forming agent, 2,2-dichloro-1,1-dicyanoethane. Recovery data were obtained using $^{32}P$-labelled compounds. The radioactivity was measured on paper chromatograms with a strip counter. In 11 of the 20 cases recoveries were >70%, in 7 = 50-70%, and only in 2 < 50%. Even when the recoveries obtained in a few cases, the method is still capable of detecting 3 ppm of the Systox thion isomer or the sulfonate or sulfates of either isomer. The thion isomer itself was not included in this recovery experiment as radio-labelled material was not available. The method will distinguish residues of Systox and its metabolites in the presence of other organophosphorus pesticides and cholinesterase inhibitors. With the application of a preliminatory chromatographic cleanup procedure, the method has been used for the detection of Systox residues in a large number of crops.

723 Frehse, H., Niemke, H., Tie ZIDS LEABAYCID (in plant material) (in German).

A procedure is described in de Lebaycid (fusarium), O-D, dimethoxy, and of the more than twenty other methods are available, each (>7.5%) of the 2 bands obtained were added. The yield is 0.05%, as absorption in the range from 7 residues in beans and hemp.

724 Hackshyro, J., Lindeque, D.P. Cotton plants from 201.

Cotton seedlings were grown in sub-resolution phosphate deficient soils.
lant products

5 in plants and mammals. usual importance. proceedings of a energy agency. 1963.

At the nature of the toxic compound has shown, the issue is partially resolved, and some problems are described with triphenylacetate (trpaac).

residues of syngold and its derivatives. j. agric. food.

metabolism in plants. the method assessor through the use of the test data were obtained using 14c. isopropyl myristate (ppm).

in < 80%. even considering the low (< 0.3 ppm) of the syringe thin

surface was not included in this method. will distinguish residues of antennae and chemosensory inhibitors. that the method has been used for

usual chemicals. ii. conta-phenyl) triphosphate.


surfaces may be conveniently plant energy to allow for a simple. the different surfaces lead to the issue (a few drops) of radioactive the rate of volatilization of.

II-H-2-b apple


A colorimetric method for residue determination is described for Cialial which is employed in the control of Carpena pomona form. i. the procedure involves (a) extraction, with proper solvents, of the insecticide from the honey. (b) separation from water-soluble compounds (e.g. sugars) eventually employed with Cialial in order to control other insecticides. (c) cleanup of the active ingredient by microdistillation or chromatography from the interfering p compounds. (d) analysis based on colorimetric determination. 14c-labelled ethyl ester of C=O dimethyldithiophosphoryl-8 phenylacetic acid and of its p-analogues, were used. Details of the thin layer chromatographic method used are given. 2.1 ppm of active ingredient may be estimated with the colorimetric method, 0.9 ppm with the chromatographic method.

II-H-2-c banana

bowman, r.s., girdle, i. robbins, a.j. THE USE OF CARBON-14-LABELED MATERIALS AS AN AID IN THE DEVELOPMENT AND UNDERSTANDING OF PESTICIDE CHEMICAL ANALYTICAL TECHNIQUES. 14th ann. chem. soc. meeting, chicago, 3-8 sep. 1961. paper 81.

by using 14c-zimorphos it was possible to perform a materials balance study on banana extracts and establish the fact that poor recoveries were not due to loss of material but to the presence of interfering agents which inhibited fluorescence measurement. cited on p. 64 in "analytical methods for pesticides, plant growth regulators, and food additives. vol. 1. principles, methods, and general applications". zwelig, g. ed. new york, academic press, 1963.

II-H-2-d beans and turnips

freese, m., morgan, m., taylor, m. METHODEN ZUR BEKOMMUNG VON HÖCHSTMASS DER INSEKTIZIDE CILIAL® IN PFLANZENMATERIAL. (Method of determining residues of the insecticide Lebacyl® in plant materials). leverkusen, hochscheid, bayer ufhochst-nach. 15. 3 (1963) 192-85.

In Germany.

a procedure is described in detail which allows residue detection (< 0.1 ppm) of the active principle of Lebacyl (lebanthin). C=O-dimethyl-C=O-methylmercapto-phenyl)dithiophosphate (at > 1750, mercaptoacetyl or 2946), and of its metabolites to be detected in plant tissue. Plant extracts were purified with organic solvents and columns of aluminium oxide or activated charcoal. For a quantitative determination two methods are available, which may be used independently or consecutively. (1) infrared absorption (> 7.55 µ) of the 3 bands obtained from oxidation, and (2) colorimetric determination of P from wet ash. The yield is 80%, and is specific for a 1964-residue which can be identified through infrared absorption in the range from 7-12 µ. 14c was used in the necessary quantitative experiments for analyzing residues in beans and turnips.

II-H-2-e cotton

heathco, j., lineberry, d.a., davies, t.b., morton, h.l. ACCUMULATION OF PHOSPHATE BY COTTON PLANTS FROM SOLUTION AND BAND CULTURE. SOIL SC. 128 (1961) 46-69.

Cotton seedlings were grown in nutrient solution containing 14c-phosphate (C=O-clo)lyl-5-(ethyl)-thio)methylphosphonic diol. (1) The latter accumulated rapidly in the roots at first (3-4 d) but
declined sharply later (7 d). Loss of I from leaves occurred passively via roots into the nutrient solution. Translocation of I from roots to leaves increased with the respiration rate. Subsequent root exposure did not, however, cause additional absorption of insecticide by the plant but, on the contrary, a leakage from roots to nutrient solution. The accumulation of I in leaves of plants grown in sand culture was linearly related to time and was positively affected by conditions favouring transpiration.


The losses of residues of methyl parathion and Guthion on leaves of cotton was accentuated. Using copper treated with 14C labelled methyl parathion or Guthion the phosphorus containing metabolites were determined by radioautographic techniques from homogenate of chloroform extracts of the treated leaves.


Methyl parathion applied to field cotton by a high-clearance spray machine at the rate of 0.5 lb in 6 gal of water per acre was found to persist on and in the foliage up to 12 d. The principal site of the residues of the insecticide was in and under the cuticle of the leaf and not on the surface. Biosyntheses indicated the residues of methyl parathion found 1, 2, 7, and 12 d after treatment of the cotton was toxic to the soil woccil (Acheta grandis Boheman). Analyses using 14C labelled methyl parathion indicated the residual half-life of the insecticide applied to cotton leaves was approximately 70 d. Maximum penetration of the leaf by the insecticide occurred within the first 2 h after application. The 14C labelled methyl parathion was not translocated from its site of application on the cotton leaf. Local analyses using radioactive methyl parathion indicated that most of the residual deposit was located within the leaf tissue, with some remaining in the cuticular layer of the leaf. Four compounds containing 14C were found in the residue. Two were identified as methyl parathion and methyl para-oxide (dimethyl phosphoramido phosphinate) and the others were not identified. Under conditions of high temperatures (70 to 90°F) more of the residual methyl parathion in the cotton leaf was converted to methyl para-oxide than under conditions of lower temperatures (70 to 90°F). The toxicity of the residues of methyl parathion over extended periods was due in part to the presence of methyl para-oxide. (Auth.)

II-H-2-f OLIVE

727 Bassi, L. DOSAGGIO DEI RESIDUI DI N-MONOMETHYLAMMIDE DELL'ACIDO O-O-DIMETILODIMETILfosforilacetico (ROGO) IN OLIVE E ORGANI VEGETALI DIVERSI. (Radioisotope determination in olives and various parts of plants of the N-monomethylamide of O-O-dimethylidimethylphosphoryl acetic acid (Rogo)). Italy. Istituto di Ricerche Agrarie. Laboratorio di Sfinge, Firenze, Montecatini Societa Generale per l'Industria Miniere e Chimica - Milano, 1960, p.3-18. (In Italian, with English, French, and German summaries).

A method is described for the chemical microdetermination in olive fruit of Roger [5-(methylcarbamyl) methyl-O-O-dimethylidiphosphates) in the control of the olive fruit fly. The method involves 3 procedures whose adoption depends on the ratio in the extract between the quantity of oily residue and of insecticide. The ratio varies with the physiological stage of the olives at the moment of analysis and with the operative conditions at the time of insecticide application. The first procedure permits 0.4 ppm determination of active ingredient, the second 0.005 ppm. The reliability of the latter was established by isotope dilution technique, using 14C-Rogo. Chromatographic, biological and spectrophotometric infra red studies were also carried out on purified extracts.


206

The work of the Institute is reviewed, the enzymatic activity of the following compounds is studied, viz. the P-O-derivative formed is administered, together with 14C labelled compounds, concentation studies to mice and rats are done and the persistence of Roger a pest, bees, cherries, and peaches.

730 Frese, H., Niessen, H., ZIS LEXACT® IN OLIVE. Lehayelcy® in olives and oil (in German).

An extraction process using 14C labelled compounds is given. The residues are enriched, followed by olive, and the P-O-compounds in metric microtechnique.


In a study which 3 different on spinach plants to determine which are the most effective. The results were then compared to data obtained from other sources.

732 Lindgren, D., Viemar, L.I. FRACTIONS PURIFIED WITH.

Bromide residues in gasoline burned by instrumental heat reactor; each 5 g sample of w.

neometer/cm²/sec at a power 1 with multichannel, analysis, of the 0.77 MeV γ-ray peaks in the reference standards. Very promising for use is given. A g/t of the wheat or in fat and higher destroy may ensue. The residue found in wheat for. A Nickel purification of the wheat is given.

see also:

510 Studies on the mechan
511 The residue potential in structural fumigation.
512 The spatial distribution treatment with SPC.
537 Effect of chlorinated terpenes.
The work of the laboratory is reviewed, particularly on parasitism. Rogers and Pac. $^{14}N$-labelled Rogers was used for studying its metabolism in olives. Methods and results are summarized. The relationship between the enzymatic activity of the fruit and the velocity with which Rogers concentration drops are discussed. The $^{32}P$-labeled derivative is more toxic than Rogers and less than parasitoid. It is formed shortly after administration, rises to a maximum, and then drops gradually. Hydrolysis leads to water-soluble acid compounds, concentration increasing with increasing Rogers degradation. Concentration in oil and toxicity to mice and rats are discussed. A series of tables deal with such topics as LDA for rats and mice, and the persistence of Rogers and derivatives in (oil) olives from treated trees, ololi (eating olives), olive seeds, olives, olives, and olives.

720 Feres, M., Nieman, H., Tse, M. Methode zur Bestimmung von Rückständen des Insekten- 
lebendes in oliven und olivenöl. [Method of determining residues of the insecticide 
An extraction process using $^{14}N$, already utilized in 1958, was further developed to the autumn of 1961. 
Details of a method are given by which residues of Lebendes may be determined in olives and olive oil.
Residues are established, followed by separation from the naturally occurring $r$-containing compounds in the 
oil, and the $r$-containing in the molecule of the active principle is subsequently determined by a colorimetric 
method.

II - H - 2 g SPINACH

721 Klein, J.K., Lang, E.P., Shoemaker, J.D., Jr. Extraction Procedures for Chloro-Organic 
In a study in which 3 different sample extraction procedures were compared, $^{14}C$-methoxychlor was sprayed on spinach plants to determine efficiency of extraction. (Cited on p. 41 in "Analytical Methods for Pesticides, Plant Growth Regulators, and Food Additives, Vol. I: Principles, Methods, and General Application". 

II - H - 2 b WHEAT

Bromide residues in fumigated wheat and wheat products were analyzed as total bromide plus organic bromine by instrumental neutron activation analysis. Irradiations were performed in a Triga nuclear reactor: each 5 g sample of wheat was neutron-inplanted for 30 min at a neutron flux of $1.5 \times 10^{12}$ 
neutrons/cm$^2$.sec at a power level of 269 kW; after a 2- to 6-day decay period and y-ray spectra were taken 
with multichannel analyzers. Concentrations of Br in the wheat were calculated by comparing intensities of 
the 0.77 MeV y-rays of 28-Br with the spectra of the activated samples with those of irradiated 
Br reference standards. Very little or no loss of Br occurred after milling with $8$% or $9$% moisture 
content wheat. A greater increase in the Br residue occurred with an increase in the moisture 
content of the wheat or in fumigation temperature. Results indicate that fumigation at lower temperatures 
and higher dosages may result in lower Br residues than fumigation at higher temperatures and lower dosages. 
The residue found in wheat fumigated for 48 h was more than $1$% greater than for wheat fumigated for 2 h. 
A repeat fumigation following a first fumigation by 94% added 94-79% more Br residue. Regardless of 
whether the wheat is fumigated and then milled to obtain fractions of whether the fractions are fumigated 
after milling, the amount of Br residue found was in the following sequence: bran > shorts > flour > middlings.

See Also:
S10 Studies on the mechanism of fumigants. (Japan. Food Research Inst., Tokyo, 1962)
S11 The residue potential of maleic anhydride, acetic anhydride, and acetic acid on 
vegetable fumigations. (Mullin and Smaw, 1962)
S19 The spatial distribution of $S$ and the identity of the tagged compounds in leaves of spinach after 
treatment with $8$%SO$_2$ gas. (Weigl and Ziegler, 1962)
S87 Effect of chlorinated terpenyls on evaporation of y-BOC. Mode of action of BOC. III. (Intal and 
Mattina, 1959)
INSECTICIDE RESIDUES IN SOILS


Laboratory experiments were carried out to determine the effects of certain factors on the sorption of insecticides by the soils used in the construction of models: the test insects were adults of Musca domestica L. or Drosophila melanogaster (L.) and the insecticides were DDT, DDE, or 
HCB. In experiments with thin layers of homogenised mixtures of soil and insecticide, in which no diffusion took place, changes in relative humidity had pronounced influence on the effectiveness of the insecticide, a 10% increase doubling the toxicity. Tests with DDT labelled with C14 showed that humidity was the only factor affecting toxicity. Studies with DDT, chlordane and radioactive DDT showed that movement of insecticide in the soil was blocked at both very high and very low humidity, and that inward migration occurred only at intermediate humidities. Migration of water in the soil caused the insecticide to move in the same direction. As at a high relative humidity the inward migration of the insecticide is blocked, and at the initial loss in effectiveness by sorption is counterbalanced by the greater availability of the remaining toxicant, the application of the usual field dosage of 6.5 g dieldrin/m² remained effective for a considerable length of time. It seems, therefore, that sorption would be a problem in the field only when humidity was low. In the search for means of reducing sorption under dry conditions, promising results were obtained with wettable powders based on ground solidified melts of chlordane and certain non-soluble resins. (From auth. summary)


Both DDT-parathion and C14-DDT were strongly sorbed by soil from water dispersions. From two different volumes of water, the percentage loss of DDT to soil in 24 h was the same (70%), but the loss of parathion with the larger volume was about half (30%) that with the smaller volume. Biocides of extracts of water and soil with larvae of Aedes aegypti showed no appreciable loss in toxicity of parathion in 24 h. Tests with molasses showed that large differences in pH, total solids, and chloride content had little effect on the distribution and redistribution of DDT at 0.05 ppm. Parathion was released into water readily from vermiculite granules; decreasing the concentration of parathion in the granules or increasing the depth and volume of water increased the percentage released at a given time. With vermiculite-DDT granules less than 5% of the DDT was found dispersed in the water at both 2 and 24 h which indicated that it was leached off at the time of application. (Auth.)

See also:

1172 The degradation of methyl heptenocyanate-S8 in various soils. (Kotiyako et al., 1961)

1187 Phosphate accumulation by cotton plants and recovery from soil. (Hachayalo et al., 1961)

II- J Radiomimetic Agents


The feeding or topical application of 14C-labelled metates to stable flies or screwworm flies resulted in preferential absorption by stable flies and a preferential rate of excretion and metabolism by screwworm flies. The only significant metabolic product was phosphoric acid. (Auth.)
The metabolic fate of a 3H-labelled sample of the chemoesterilant metapoxide (trimethylsilyl phosphine oxide) was investigated. In both larvae and adults of the mosquito Culex tarsalis Coquillett, degradation of the chemical was complete within 48 h of administration. Adult houseflies (Musca domestica L.) degraded 55% of large doses of the chemical within 5 h. The rates of degradation were similar in a susceptible fly strain and in two organophosphate-resistant strains. In mice the observed rate of degradation was about the same as in houseflies. Metapoxide and one major breakdown product, presumably phosphonic acid, were characterized by paper chromatography from excreta of products of both houseflies and mice. (Auth.)

Up-to-date review article. To study the action of the chemoesterilant mepepa, 3H-labelled mepepa was applied topically to Musca domestica L. It was rapidly absorbed and degraded. About 50% of the administered dose was absorbed and degraded in 1.5-2.0 h. Within 24 h, absorption and degradation were almost complete. Paper chromatographic studies indicated that much of the excreted radioactivity was unmetabolized mepepa. More than 99% of the total 3H recovered in 24 h was excreted within 8 h of treatment. Similar studies showed that mepepa was rapidly absorbed and metabolized in Culex tarsalis and white mice. Degradation of mepepa was substantially complete within 48 h after administration to larvae and within 24 h for adults. No degradation appears to be caused by enzymes other than those responsible for resistance to the organophosphate compounds. Additional studies showed that 3H-labelled mepepa was also rapidly absorbed and degraded by the common malariac mosquito Anopheles quadrinaculatus, the yellow-fever mosquito Aedes aegypti, the screwworm, and the stable fly. The screwworm fly absorbed topically applied mepepa only half as rapidly but excreted it twice as fast as the stable fly. (Auth.)

See also
1179 Some effects of gamma radiation and aspholate on the reproductive tissues of Drosophila melanogaster. (Meehanberry and Canfell, 1968)
1180 Preliminary observations on chemosterilization of mosquitoes. (Weidhaas et al., 1961)
1378 Mating ability of male mosquitoes, Aedes aegypti (L.), sterilized chemically or by gamma radi- ation. (Weidhaas and Schmidt, 1965)
PART II
IONIZING RADIATIONS
Anonymous. EFFECT OF NUCLEAR PROGRESS REPORT BY THE INDIAN C R.

The study of the effects of radiation on cells of Zygia mandarina and mice of Bontoy biologically affected by radiation mutations, and are generally due to structures with accompanying cell-lyzing causes of both radiation and peculiarities of the particular plant may be called the genetic th.

A. A. ASTEROPHON. BIOLOGICAL SIGNIFICANCE OF NUCLEAR INJURY. (Trav. inst. Inst. Obshch.)

The relative significance of the normal results. Thus, heavy x-rays do not prevent normal development and genetic damage with a high demonstrated by Taisse and B. mori, for instance, are more radiosensitive than triple-tivity are obtained in some in cultures of the various biological genetic elements of stem cells biochemistry.

B. ALEXANDER, P. COMPREHENSIVE REVIEW OF THE EFFECTS AT THE CELLULAR LEVEL. TO BE MORE RADIOTHERAPY THAN...
I BASIC RESEARCH

I-A Genetic and Cellular Effects

I-A-1 GENERAL ARTICLES. SURVEYS. BOOKS.

Progress report by the Indian Council for Agricultural Research in New Delhi.


Review article. On the basis of data from work on Drosophila melanogaster, Helobacuca, spores of Parus luteolus, cells of Zygodeum, amoeba Porom, the sigh Acanthium, and on females of Bombyx mandarina and males of bombyx mori, an explanation is attempted of the variety of ways in which the biological effects of radiation manifest themselves. They may range from radiation injury to induced mutations, and are generally treated separately. The author maintains that destruction of vital nuclear structures with accompanying damage to hereditary elements and their role in biosynthesis are the underlying causes of both radiation injury and mutation effects, the actual differences being due to the peculiariies of the particular living system considered. The general radiobiological concept put forward may be called the genetical theory of radiation injury.


The relative significance of damage to nucleus and cytoplasm are reviewed in the light of different experimental results. Thus, heavy x-irradiation of the unfertilized egg of Bombyx mori (doses up to 500,000 G) does not prevent normal development, provided the irradiated egg is emasculated and development proceeds androgenically with a heavily irradiated cytoplasm but with non-irradiated normal male nucleus. As demonstrated by Tsitskawa and Astashov (Biophysics USSR, Engl. transl. 1:1988,183), triploid embryos of D. melanogaster, for instance, are more resistant to x-radiation than diploid ones. Similarly, tetraploids are still more radiosensitive than triploids. Good agreement on the correlation between polyploidy and radiosensitivity are obtained in some microorganisms, in numerous higher plants and in Helobacuca. It is concluded that the various biological effects of radiation are mostly due to initial destructive changes in the genetic elements of cell nuclei accompanied by their distinction in the processes of constructive biosynthesis.

Comprehensive review of the whole field. The chapters on radionuclides substances and on radiation effects at the cellular level are of particular interest in the present context. Individual insect cells appear to be more radioreistant than comparable individual cells of other organisms.
Review article. Radiations and chemical mutagens kill cells in numerous ways: by one or several kinds of induced dominant lethality, by a direct inactivating action with sperm, and by genetically undefinable types of death which may or may not be related to dominant lethality per se. Also, chemical mutagens appear to exert a custom enhancement of the fertilizing capacity of sperm. The different stages of oogenesis and spermogenesis respond with unusual sensitivity to radiation, and individual cells pass through stages varying as much as a 50-fold difference in sensitivity. Where species of Diptera, Hymenoptera and Collembola can be bred, a striking similarity of response to radiation can be observed, both in stage sensitivity and degree of response with dose. The silkworm, Bombyx mori (Lepidoptera), seems to be similar in most respects to representatives of the other orders in response of germ cells to radiation, but differs sharply in types of dominant lethality induced. Species having sympathetic genetic mechanisms (e.g., the lecanid system of Panorpa comma (Hemiptera: Coccidae) are special cases, and their responses to radiation are considerably modified from those of other species. For insect population control by the irradiation-of-male method, dominant lethality is an advantageous stage where mating is multiple as in species where mating occurs once. Sperm inactivation and gonad killing can be regarded as instances of true sterility and are maximally effective only in species where mating occurs once. For most efficient control, doses should be chosen which would induce maximum dominant lethality, minimum sperm inactivation and complete killing of gonad cells. These parameters are simple to determine by gamete viability measurements, irradiated and unirradiated population composition experiments and histological examination of gonads. (Auth.)

Davidson, G., Mason, G.F.GENETICS OF MOSQUITOES. Annu. Rev. Ent. 8 (1963) 177-90.

The literature was concluded in February 1962. This review article is divided into sections on genetics of insecticide resistance, formal genetics of other characters, and hybridization and speciation. (Some work in which radiation (x-) was used to induce mutations in Coenosipta mutans, C.p. fatigans and Anopheles gambiense and to cause sterilization as in Anopheles quadrimaculatus is included.)


The whole field is reviewed. The book is divided into sections on the structural, physical and chemical bases of heredity, the physical nature of the biological section of radiation; the effect of ionizing radiation on heredity of animals, plants, microorganisms and viruses; the action of ultraviolet rays on heredity, the radiogenic effect of visible light, radiation genetics of mammals, learning radiation and human heredity radiation selection of plants and microorganisms; and concluding remarks. A total of 888 references are given. Results obtained from studies on grasshopper, Drosophila, and other cled.

Grouch, D. S. ENTOMOLOGICAL ASPECTS OF RADIATION AS RELATED TO GENETICS AND PHYSIOLOGY. Annu. Rev. Ent. 7 (1962) 81-106.

A comprehensive review article which is divided up into 9 main sections documented by 208 references. The subjects are broken down into genic production: hatchability (exposure of embryos, exposure of parents); irradiation of larvae and pupae (survival, developmental abnormality); gene mutation, endogenous life span of adults (irradiated as adults, irradiation before adulthood); physiological aspects: radiotranscape studies; population studies; and tissue culture.


Review of findings reported at Leiden 1963 symposium. Periods of mutagenesis, initial lesions, chromosomal aberrations, inactivation and mutation, dose rate and fractionation, and stage sensitivity are discussed. The author comments on the similarity, in diverse organisms, of the patterns of sensitivity for comparable germ cell stages.
THEORETICAL ESTIMATION OF "SURVIVAL CELL NUMBER VERSUS DOSE" CURVE FROM EXPERIMENTAL FREQUENCY DISTRIBUTION OF THE NUMBER OF MUTANTS.


Kuoia, H. P. MUTAGENIC EFFECT OF X-RAYS ON MUTS.


Referring to the paper published by Müller et al., in Nature 194 (1962) 789 (ref. 740), the author disagrees with their interpretation, and states that the increase in mutation frequency for low doses is not less, but very much more than would be expected from the results of irradiation with higher doses.

Laver, H. VERERUNG DURCH KERNENGE UND Das PROBLEM DER AUSSEKARYOISCHEN VERERUNG BEI Culex pipiens. 1. HEREDITÄTENERBUNG. (Nuclear gene heredity and the problem of extrakaryotic heredity in Culex pipiens. 1. Heredity transmitted through the nucleus.)

The possibilities of Culex pipiens for genetic studies are considered, and its biology, breeding, and special techniques to be used are described. The need for inducing by irradiation the simple mutations required for each work has led to one particular series of experiments, in which 5-6 d-old males were given 1000 r-rays (40-40/cm, 150 kV, 7-8 mA, 1 mm Al filter), followed by mating with non-irradiated females. A drop in eggs fertilized and larvae hatched was observed. The first generation showed 9 mutations (theoretically dominant), (hap. Rap). Subsequent breeding under specified conditions revealed also some recessive mutations, (hap. Rap). Radiation-induced and spontaneous mutations are described. Some of the mutations are dominant, some recessive, and some are sex-linked. Nuclear genes in Culex are transmitted normally, in accordance with Mendelian principles. - Part II, p.476-516 deals with "AUSSEKARYOTIACHE VERERUNGER" (extrakaryotic heredity), and an analysis of crossing relations. It is followed by a listing of the literature cited in parts I and II.

Müller, I. MUTAGENIC EFFECT OF X-RAYS ON MUTS.


Replying to Kortchak's criticism of his own (No) induction concerning the effects of very low doses of x-rays Müller stresses that somewhere between 10-20 there must be a steep increase in mutation frequency, possibly occurring as a rather sudden step which might imply the existence of a protective mechanism, destroyed by doses between 10 and 20.

National Inst. of Genetics, Mitsuhs., Japan.


Results are summarized from genetic studies in insects, mice, salmonella, plants, and man. Emphasis was placed on studies in Drosophila, silkworm, wheat, rice, and forest trees. Data are included from studies of mutations induced by x-irradiation in Drosophila and silkworm. A list is included of publications during the period. (From NIA 18; 1964, 850g)

Norsk Hydro's Inst. for Cancer Research, Oslo.


Research activities of the Norsk Hydro's Institute for Cancer Research during 1951 and 1952 are summarized. Studies were continued in the fields of radiobiology, pathology, genetics, biochemistry, and biology. A list is included of 122 papers published, or in press, as a result of the research programme. (From NIA 18; 1954, 1321).

Ray-Chaudhuri, S. P. IONIZING RADIATIONS AND THE INDUCTION OF CHROMOSOME MUTATIONS IN THE GERMINALS.


Review of work done by the author and his associates on males of Genus sp. Different sections are devoted to the different types of chromosomal aberrations, in particular and anaphase abnormalities induced by x-rays and absorbed PM, and to the chemical protection afforded by sodium salicylate, veramine (4-hydroxy-isonicotinic acid), and eurepam.

Russell, W. L. GENETIC HAZARDS OF RADIATION.


Includes mutation experiments with Drosophila.

Progress is reported in studies on the transmutation of mutations through the egg or sperm of Drosophila, the effect of various mutations in the growth medium on mutation rate in Drosophila, the random assortment of nonhomologous chromosome elements in male D. melanogaster, and chromosome arrangement in mature sperm of Drosophila. (NSA 18: 1964, 1952).


Review article. It aims to give an elementary background to the principles and theories in radiation genetics. Drosophila data are cited freely. The author discusses the types (imma- and intromerogenic) genetic effects; the effect of slow neutrons; the induction of mutations by cosmic and other natural radiations; gene site from target theory; dominant lethals; genetic effects of ultraviolet radiation; modifi- cation of x-ray-induced mutagenesis; the oxygen effect; and the effects of polychromy on radiation-induced mutagenesis. 165 references cover relevant literature from 1927-1965.

See also:
1201 Cytological effects. (Tsimshian, 1961).

I-1.2 DOMINANT LETHALITY. STERILITY. CELL KILLING.


The frequency of occurrence of dominatal lethal mutations in spermatids of Drosophila subjected to fast-neutron doses from 500 to 5680 rad was found to be directly proportional to the radiation dose. In spermatids, the frequency of mutations for the range from 500 to 1500 rad on the dose curve was also found to be proportional to the dose, while it lagged considerably behind a linear dependence on dose over the range from 1520 to 2400 rad. In spermatozoa, the character of the dose-dependence of dominant and recessive lethal mutations induced by y-rays, x-rays, and fast neutrons was completely analogous. The SBE of neutrons in the case of spermatozoa is approximately 3 times greater than that of y-rays, whereas in spermatozoa the neutron SBE is only 1.5 times higher. The radioactivity of spermatozoa to fast neutrons was found to approach that of spermatozoa. (From auth. conclusions).


Still using the developing germ cells of Drosophila viridis, the variations in radiosensitivity of non-dividing cells were shown to depend both on differences in sensitivities of the chromosomes for breakage and differences in enhancement of biological damage from environmental changes. A differential action upon cells in division and non-dividing cells was shown. Preliminary studies indicate that intergal lethal actions resulting from treatment of dividing cells can be separated and tested with the various radiations. Data are included on the effects of radiation from helium, nitrogen, accelerator neutrons, therapy x-rays, y-rays, and 22-MV x-rays from a betatron accelerator. Germ cells of varying sensitivities were exposed in an atmosphere of O2 or N2. Data are presented graphically. Results are included from a study of mutation rates at specific gene loci in mature sperm and spermatogenetic cells of D. melanogaster. (From NSA 17: 1962, 2877).


Further results are reported from studies on the effects of radiation dose rates on genetic damage in mature sperm and various types of germ cells of the spermatogenetic cycle in Drosophila viridis. Tests were made for genetic mutations at specific damage after treatment of man.


Results are reported of exposure of studies on the types of genetic spermatogenetic cells of Drosophila subjected to X-rays and neutrons. Results are reported of sex chromosomes and the 1250.

761 Artopo, C.H., and Marth, V. ВНОЯБРЬ ОБУЧЕНИЕ БАРЬЕРОВОГО ДОГОЛУБОКУ.


The doses of x-irradiation of the monkeys in limiting the currency of this work limiting the results of the current work.


Immunosub in vitro. Recombin. x-rays, chosen to produce recombination in vivo by x-rays in such a way that the results may be used as an introduction. Exposure in the case of a very high dose (17 500 rad) in percentage viable eggs for 2nd and 3rd months, the rest male. Greater effectiveness result from the introduction of Drosophila viridis.


The sensitivity in terms of x-ray measured for multiple eggs 1 900 rad. Hyper-sensitivity is found in in contrast to irradiation of the